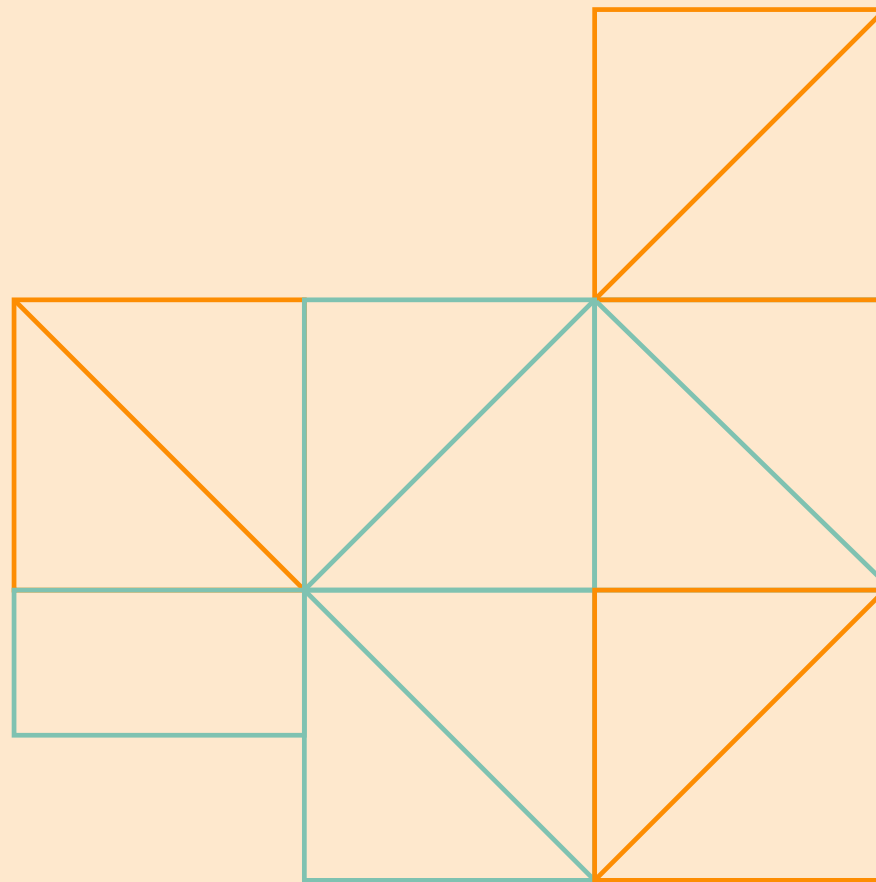


# A RESILIENT COMMUNITY

HOUSING FOR SINT MAARTEN



P5 - MAUD HOUTERMAN

# CONTENT

FRIENDLY ISLAND  
PROBLEM STATEMENT  
OBJECTIVE  
DESIGN  
CONCLUSION AND RELEVANCE

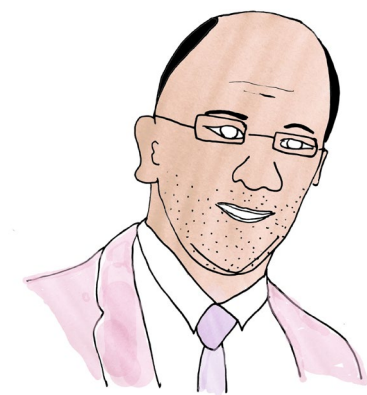
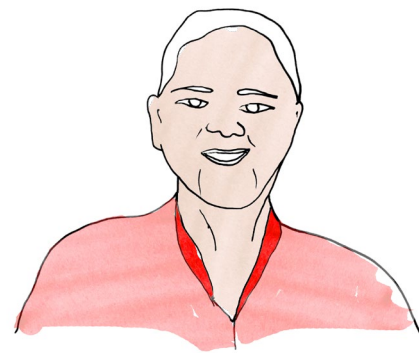
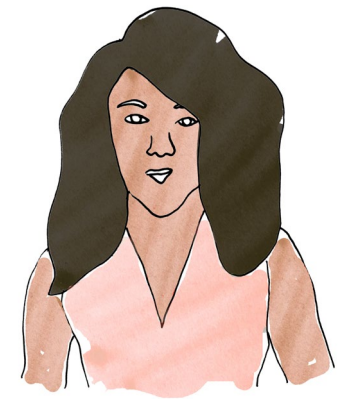
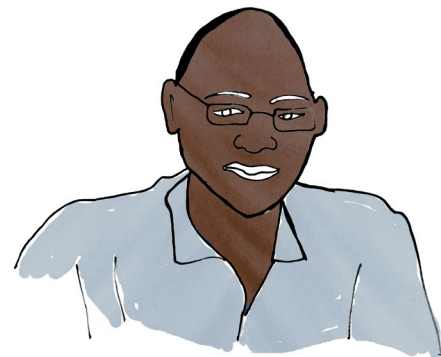




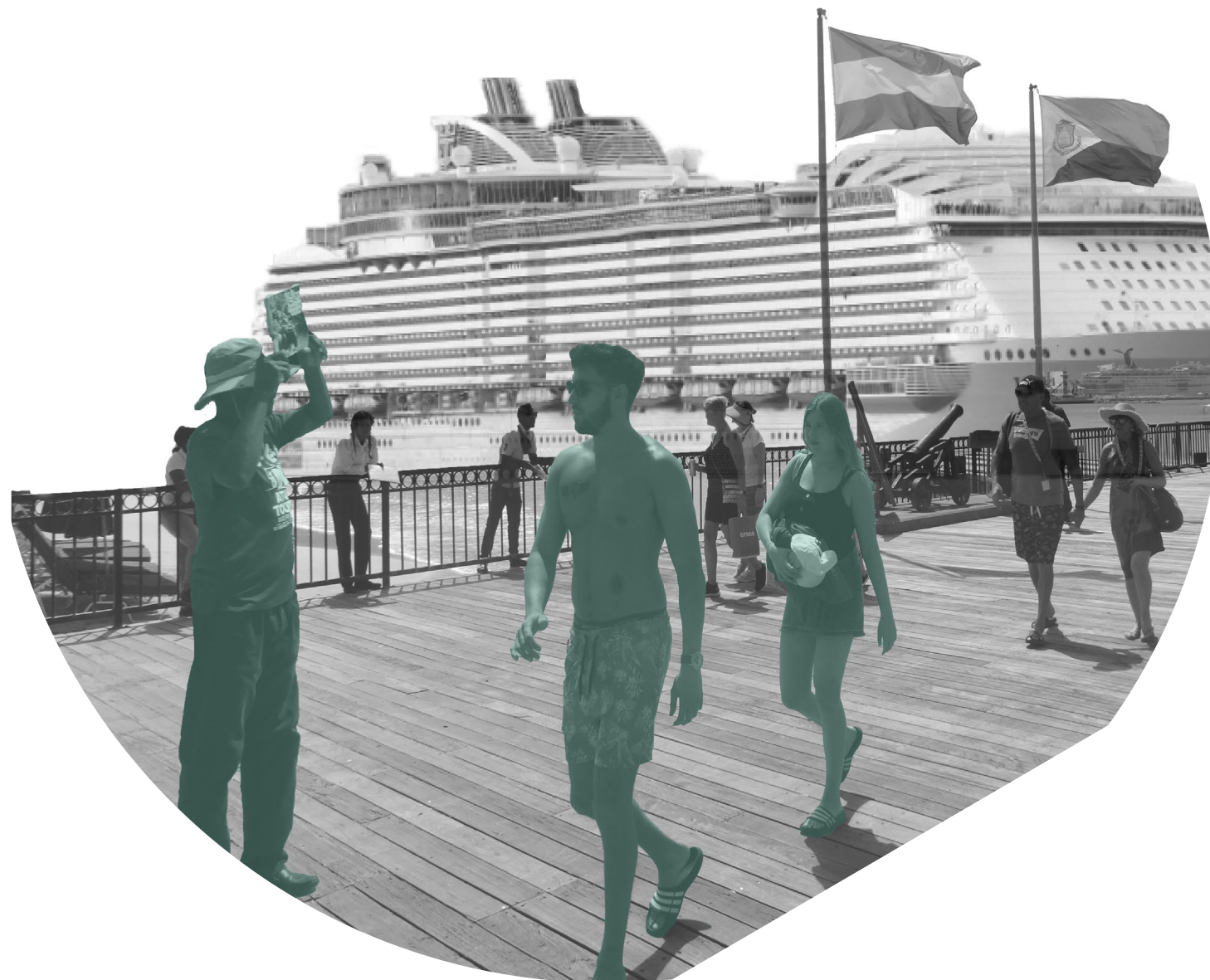
# SINT MAARTEN



# RESIDENTS OF SINT MAARTEN



# ECONOMY

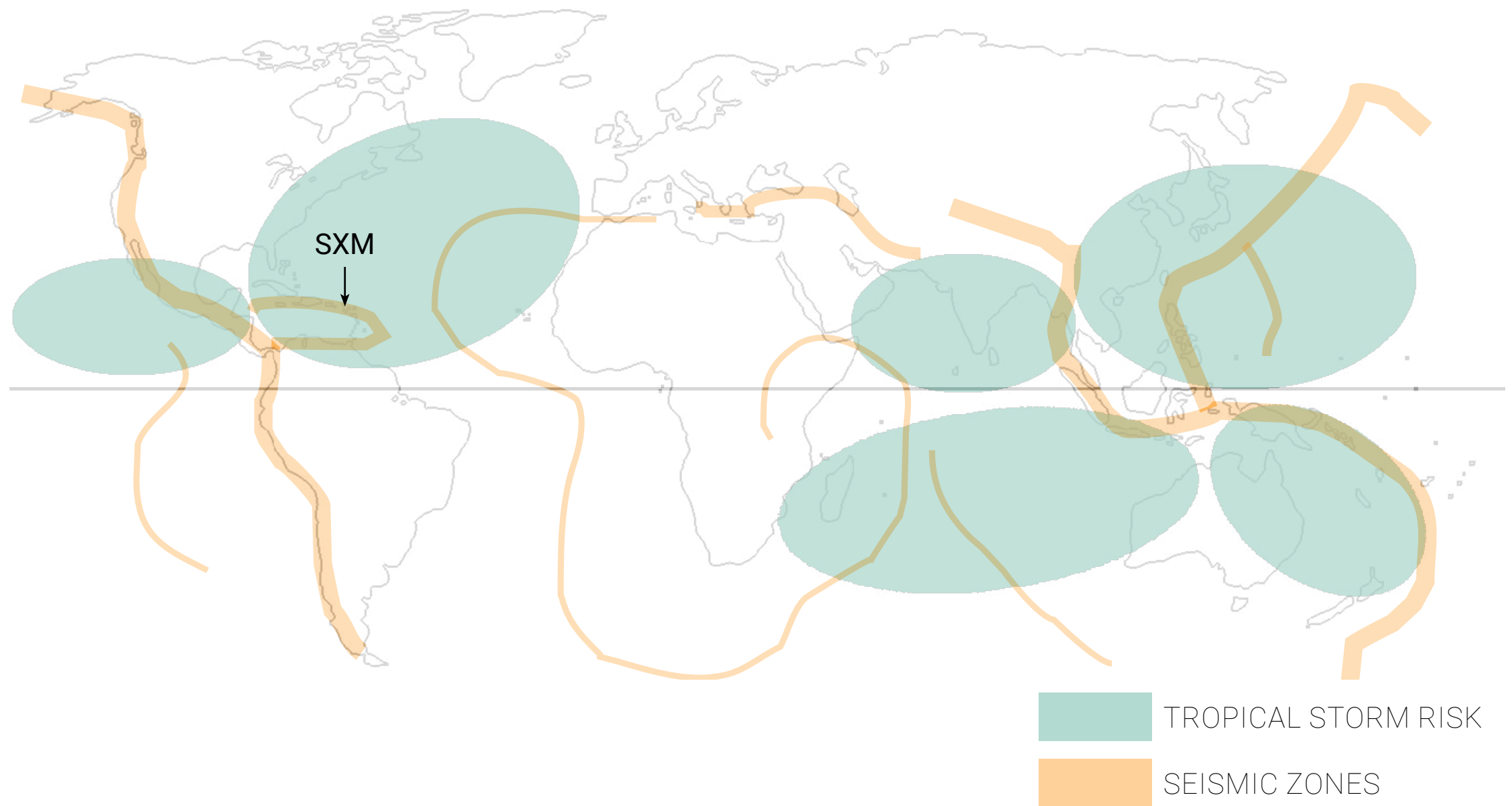




# TOURISM



# RISK ZONES





*"Everywhere have different things, we have hurricanes and you have snowstorms. Everywhere, anywhere in the world is some type of natural disaster. You just need to prepare for it."*



*"But **I grew up that way.** When there was a hurricane, ah nice, we do not have to go to school! Than we went swinging. And there were big waves. As kid you did not know the danger, ofcourse. For weeks on end we had sand in our hairs, everywhere. Yes, it was an experience that you have to go through to understand fully. **The first was Irma, that was the worst.**"*

# IRMA



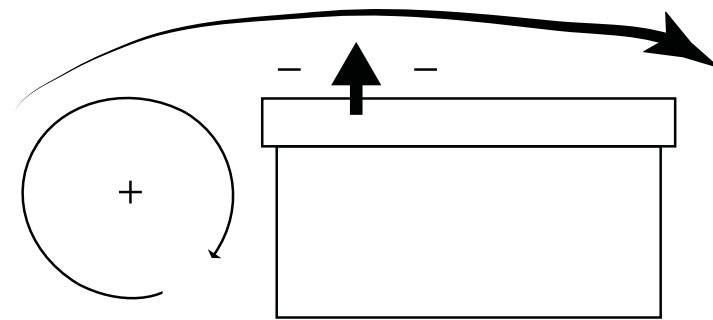


# IRMA

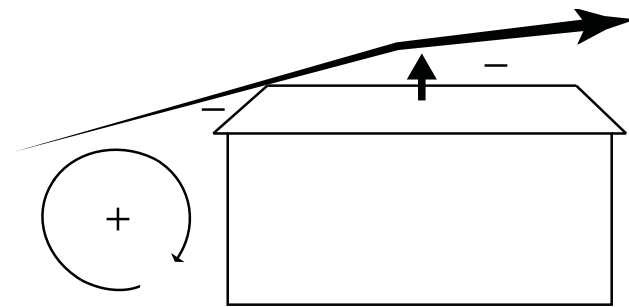


Retrieved from <https://www.bustle.com/p/how-much-damage-did-irma-cause-in-st-martin-the-caribbean-island-is-devastated-81450>

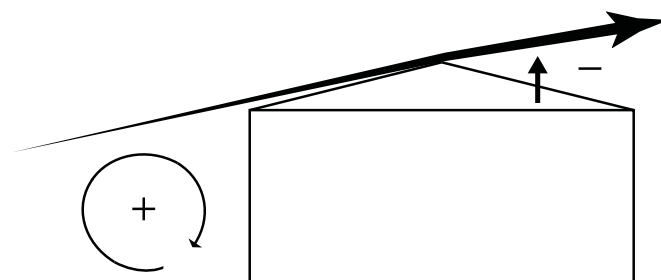
# EFFECT OF WIND



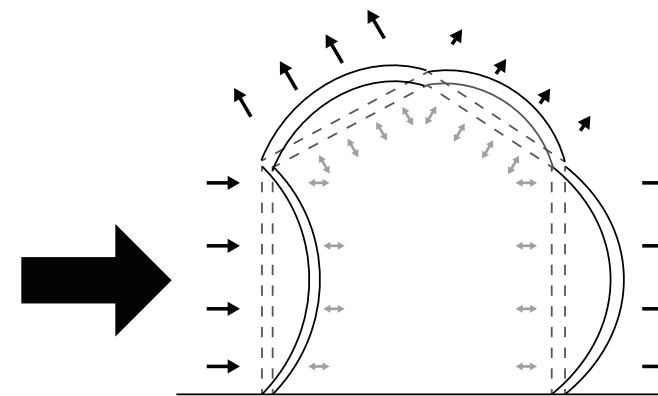
Gable - high uplift



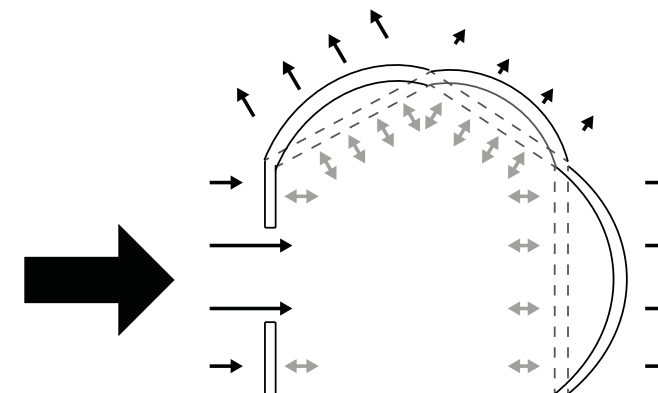
Hip - lower uplift



Pyramid - lowest uplift

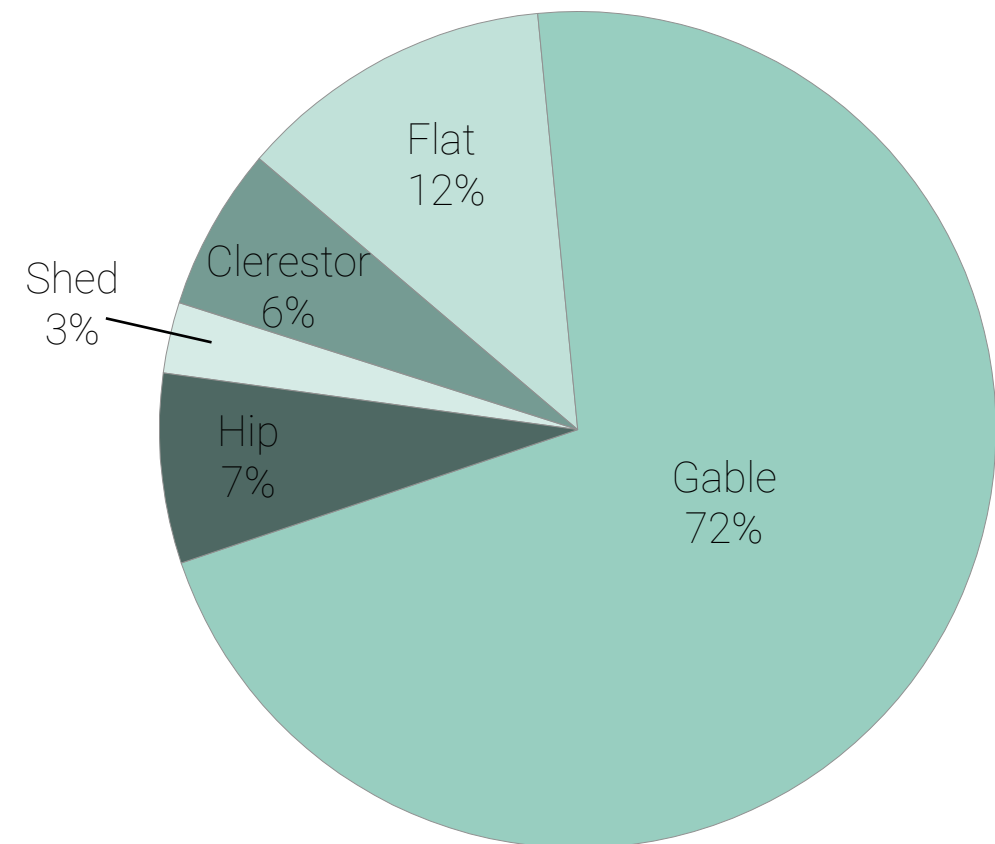
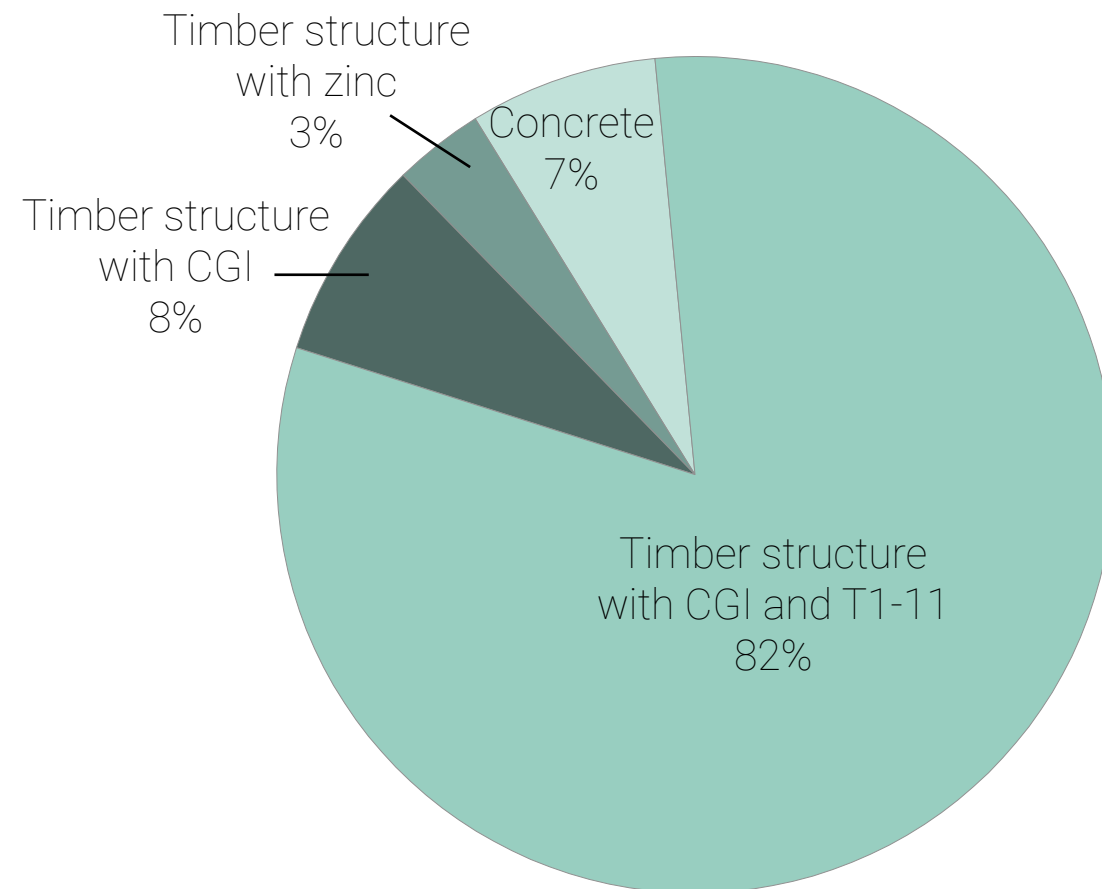


Enclosed building

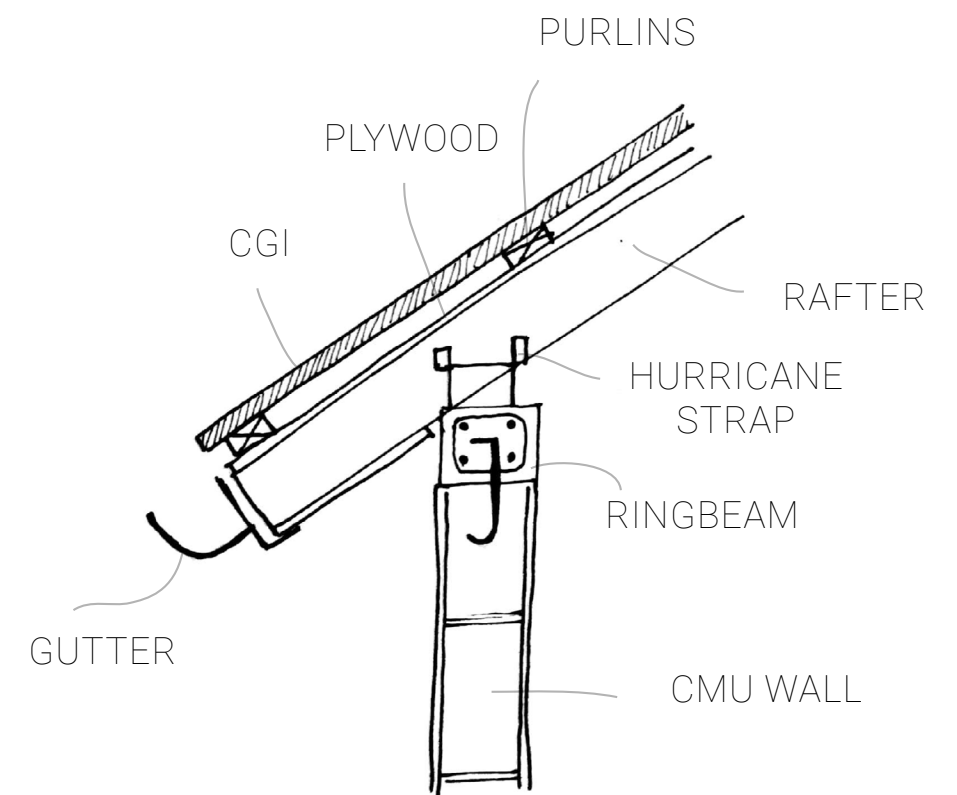


Partially enclosed building

# ROOF TYPES



# ROOF TYPES



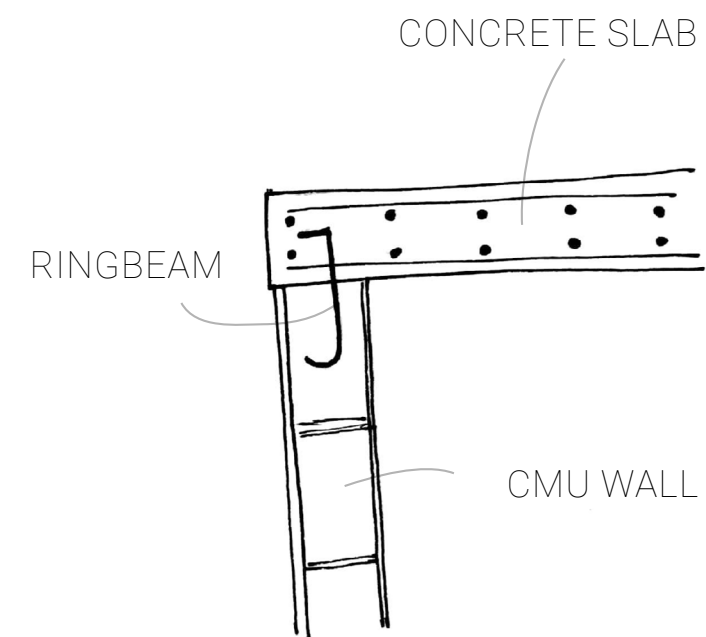


# ROOF TYPES

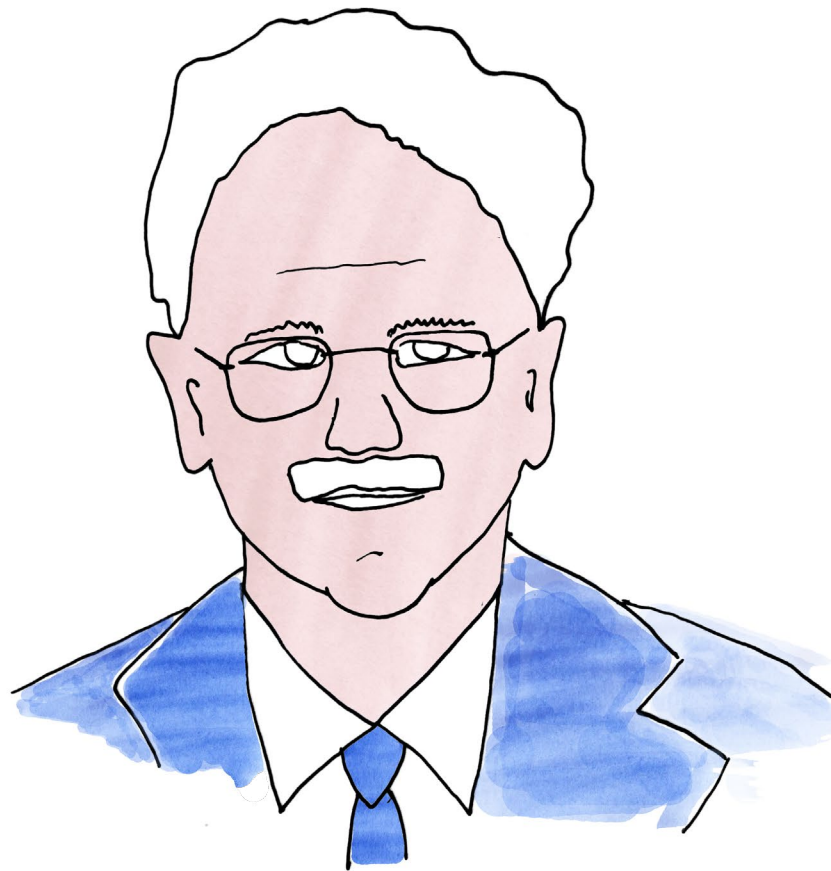




# ROOF TYPES



## VIKTOR SCHAAP



*"There is something wrong with the building regulations and their enforcement. On Sint Maarten, one building has been damaged and the other destroyed. And **a storm is not selective that it only hits uneven numbers**. That is something I don't believe. So, **this is a case of no enforcing and no building legislation**. So I just think that in two thirds of the world there is a vulnerable housing stock, and certainly in the bottom of society. And you do not know that until there has been a disaster."*









*My aunt roof went and she had to **pay the contractor 150 dollar per day**. So my aunt her money finished faster on labor."*



▲ Ravage na orkaan Irma op Sint-Maarten. Beeld uit 2017. © ANP

## Rode Kruis helpt langer na orkaan Irma op Sint Maarten

Het Rode Kruis blijft ook de komende tijd op Sint-Maarten nog daken repareren die werden verwoest tijdens orkaan Irma in 2017. Dankzij een bijdrage van 3,3 miljoen euro uit het door de Wereldbank beheerde trustfonds Sint Maarten kunnen nog eens tweehonderd verwoeste daken worden hersteld.

Buitenlandredactie 20-02-20, 07:07

In Nederland is destijds 18 miljoen euro ingezameld om de door de orkaan getroffen eilandbewoners te helpen. Vrijwel al dat geld is nu uitgegeven aan onder meer schoolmaaltijden en voedselbonnen. In totaal werden 27.000 mensen de eerste maanden na de ramp geholpen met noodhulp, als water, voedselpakketten en hulpgoederen, meldt het Rode Kruis.

### Kwetsbare groepen

De hulporganisatie is blij met het extra geld uit het fonds van de Wereldbank. „Tot nu toe hebben wij gewerkt in een aantal buurten. We zijn begonnen in de wijken waar de meeste schade was en de kwetsbaarste groepen wonen. Nog altijd zijn er families die hulp nodig hebben met het herstellen van hun woning”, zegt Fanny de Swarte, hoofd van de hulpoperatie van het Rode Kruis op Sint-Maarten.

Naast de praktische hulp, probeert de organisatie bewoners te helpen zich voor te bereiden op een mogelijk nieuwe ramp. Door orkaan Irma raakten veel mensen niet alleen hun huis kwijt, maar hun baan in het toerisme. Mensen uit de toeristenbranche worden nu bijvoorbeeld geholpen zodat ze ook op een andere manier geld kunnen verdienen.

Terwijl Nederland en Sint-Maarten nog steggelen over de inzet van de honderden miljoenen euro's voor de wederopbouw, vroeg Trouw vier experts naar hún plannen. Herbouw moet het begin zijn van een zelfvoorzienend eiland.

# PROBLEM STATEMENT

## **Main problem:**

Limited resilient housing stock due to the lack of building regulations and affordable materials and contractors.

Not enough local income sources.

## **Results in a community that:**

- Needs to restore the housing stock every time after a hurricane
- Has no income to buy materials



*"There are 6 cruise ships a day and there is a thousand extra people on the island. It is really good when the money is coming. But how substantial could it be. Eventually people are going to stop coming with cruise ships eventually everyone is going to have planes. And you are only available to do so much. So **we have to find other ways to sustain and develop.** And also because the population is growing so fast."*

# OBJECTIVE

## **Goal:**

“design resilient housing for Sint Maarten which has a positive influence on the local income generation”

## **Design question:**

“How do we solve the need for resilient housing on Sint Maarten and create a local income source?”

# APPROACH

WHY

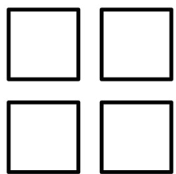


Poor quality constructions



No local income source

HOW



Understandable construction technique



Prefab construction of waste

WHAT



Resiliency



Local Circular economy



# PLASTIC

Yearly plastic waste generation of Sint Maarten is 3.751 kg



**Research:**

“What are the potentials of HDPE plastic waste as material for hurricane resilient sandwich panels that improve the insulation value on Sint Maarten?”



# PLASTIC



WATER  
BOTTLES



MILK  
JUGS



BOTTLE  
CAPS

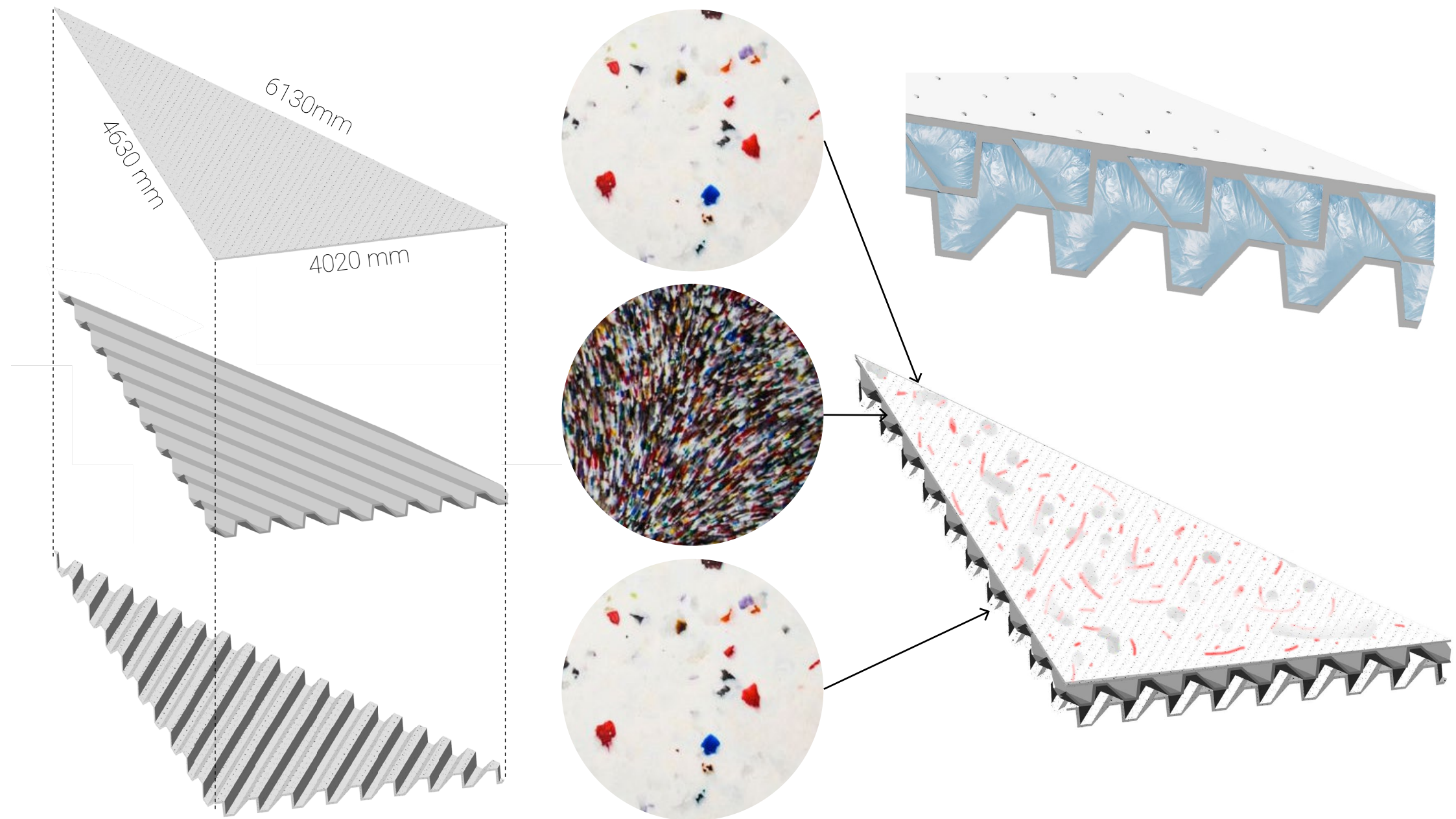


SHAMPOO  
BOTTLES

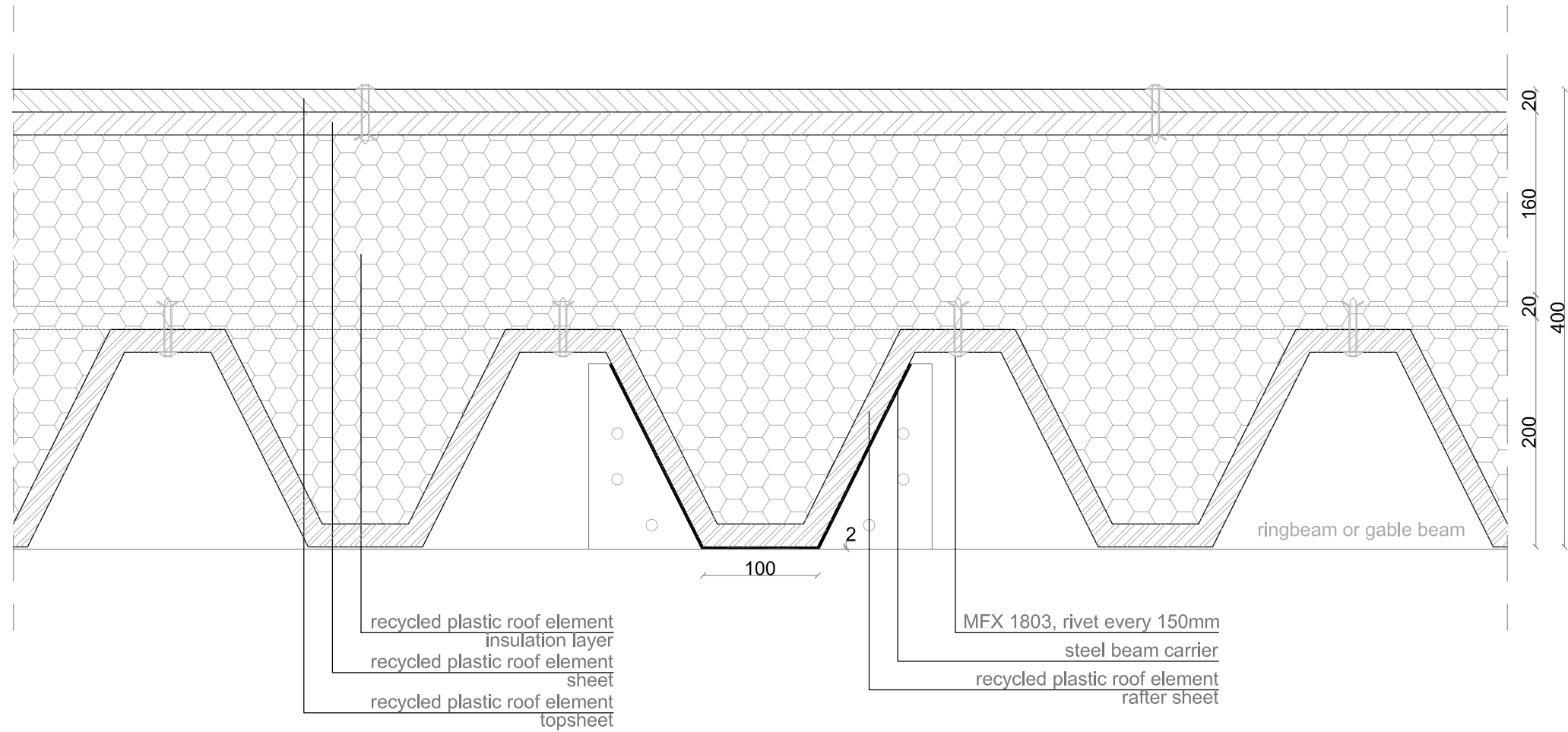
## ROOF PANEL



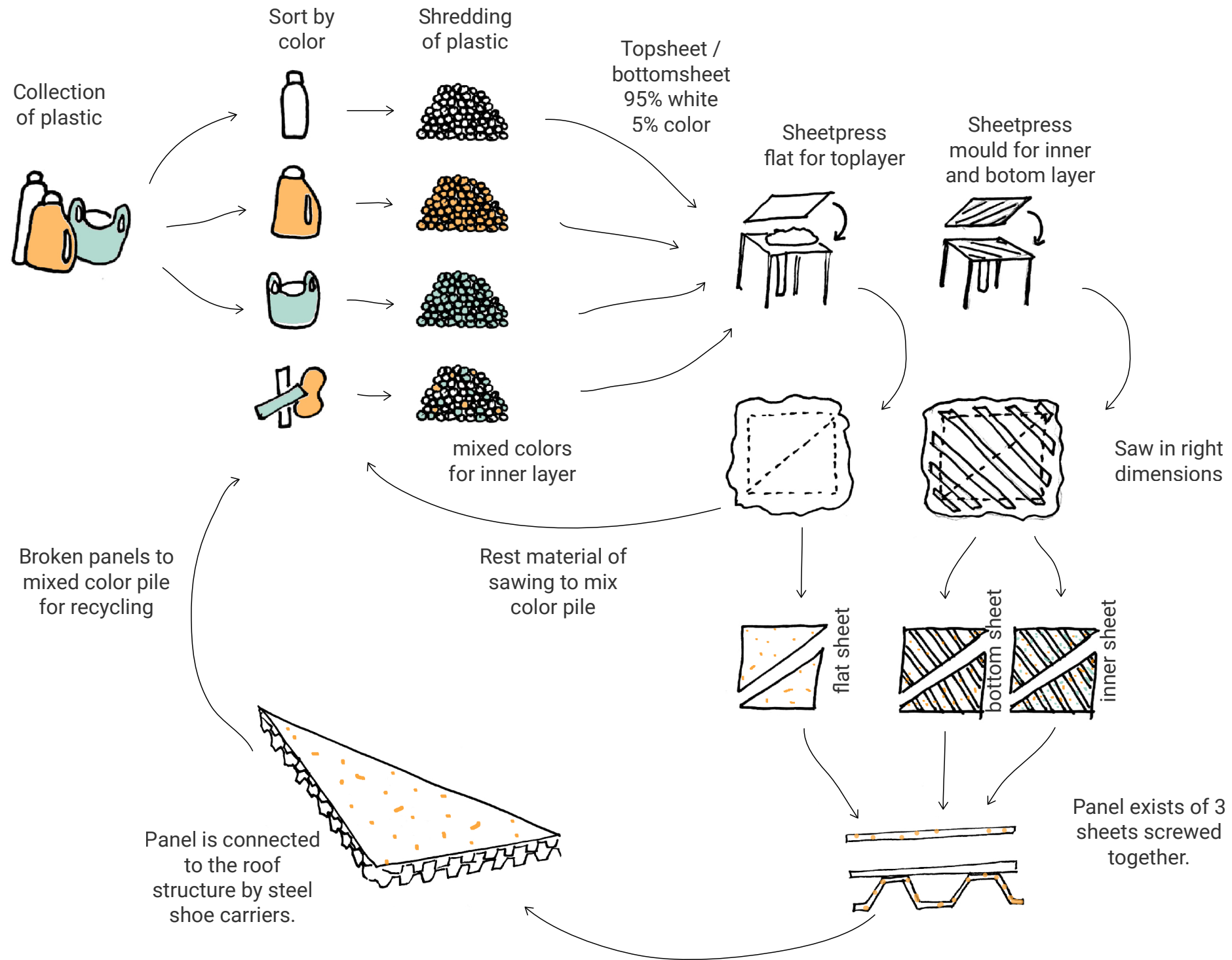
# ROOF PANEL



# ROOF PANEL



# CIRCULAR SYSTEM





# FACTORY



# SITE



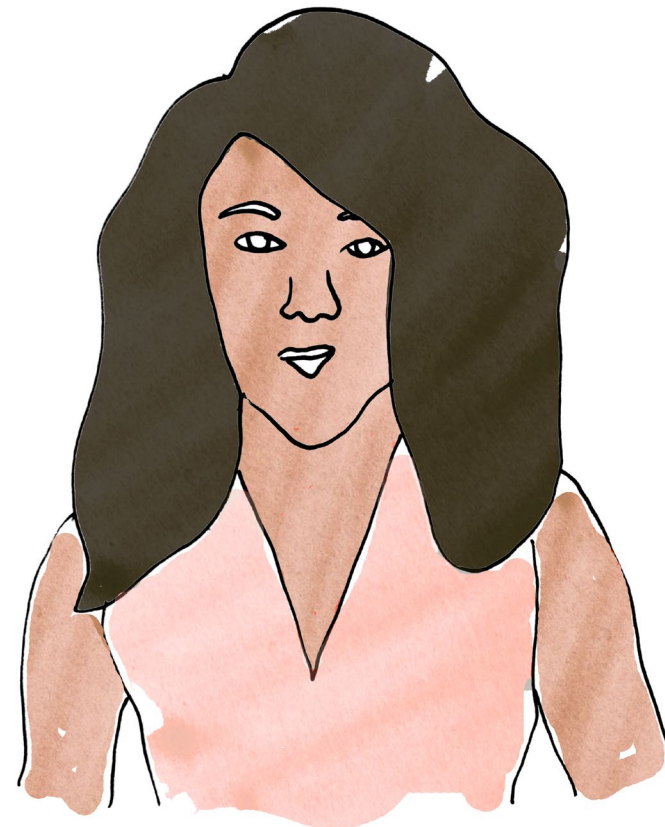
# THE ONES IN NEED

Elderly



*"I get 700-800 guilders for my retirement, how in god sake will I ever be able to rent an apartment of 800-900 dollars per month?"*

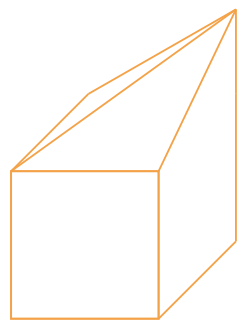
Young families



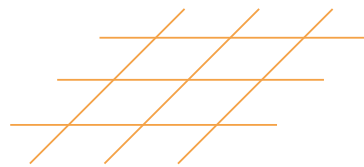
*"Well, you see the options out there? Because if I go for three bedroom now outside I have to pay at least 1300 dollars. That is my whole salary. How do I eat? How do I pay daycare? Daycare is 300 dollars."*



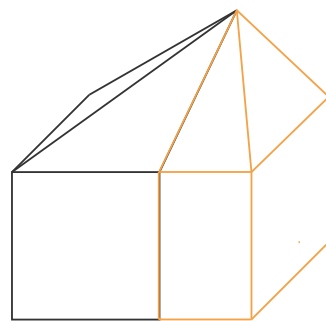
# CONCEPT



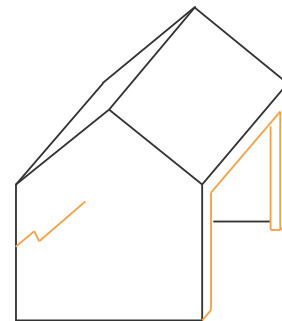
Small  
Roof-  
surface



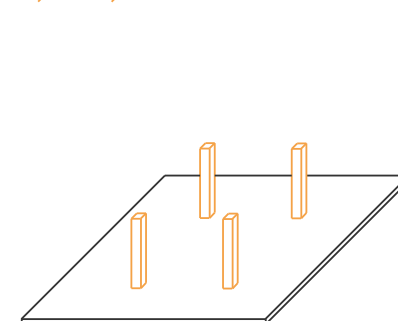
Understand-  
able grid



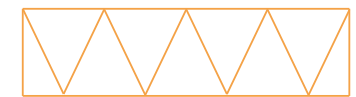
Additions



Levels of  
resiliency

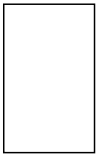
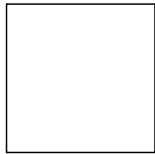
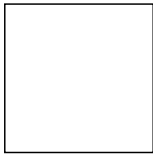
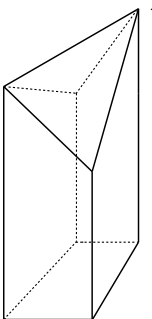
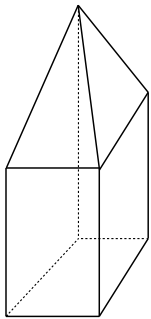
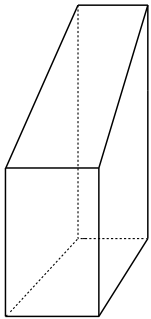
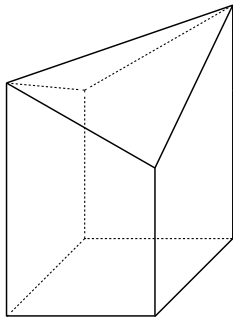
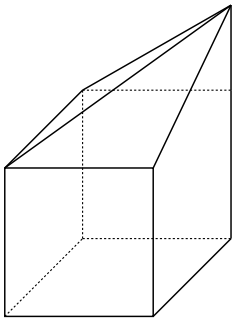
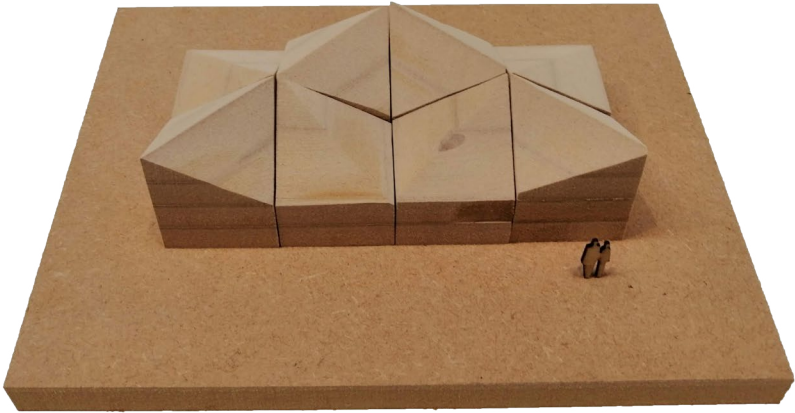


Providing  
a solid  
structure



Recycled  
plastic  
replaces  
current  
materials

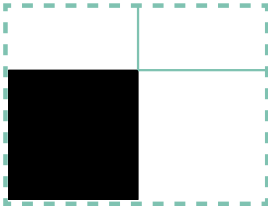
UNITS



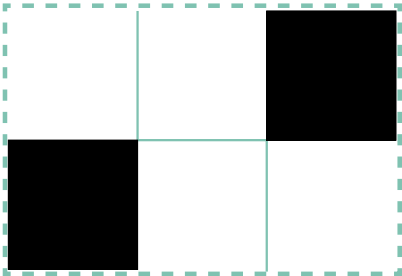
4 x 4 m

2 x 4 m

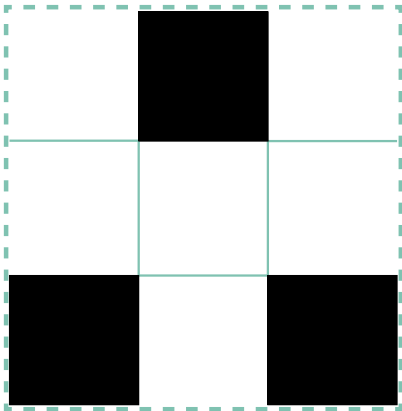
UNITS



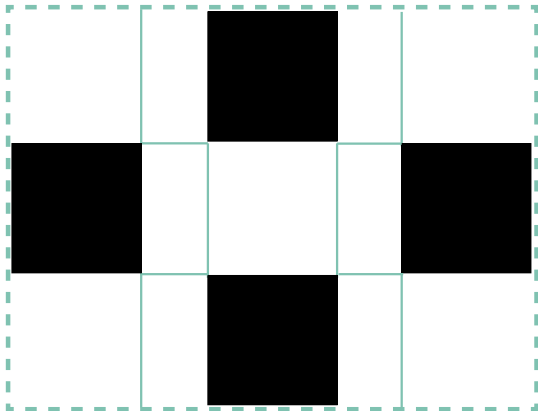
1 unit



2 unit

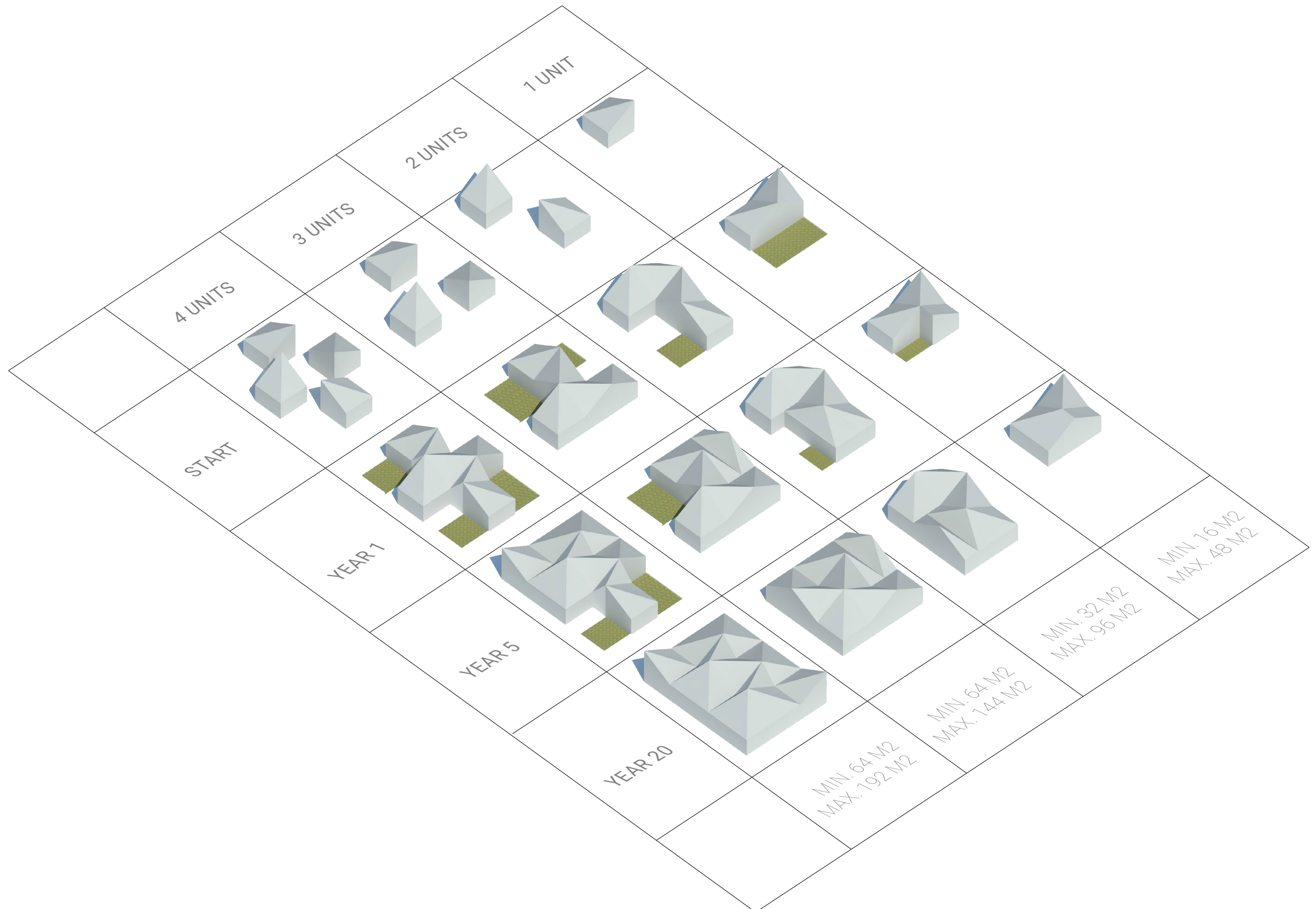


3 unit

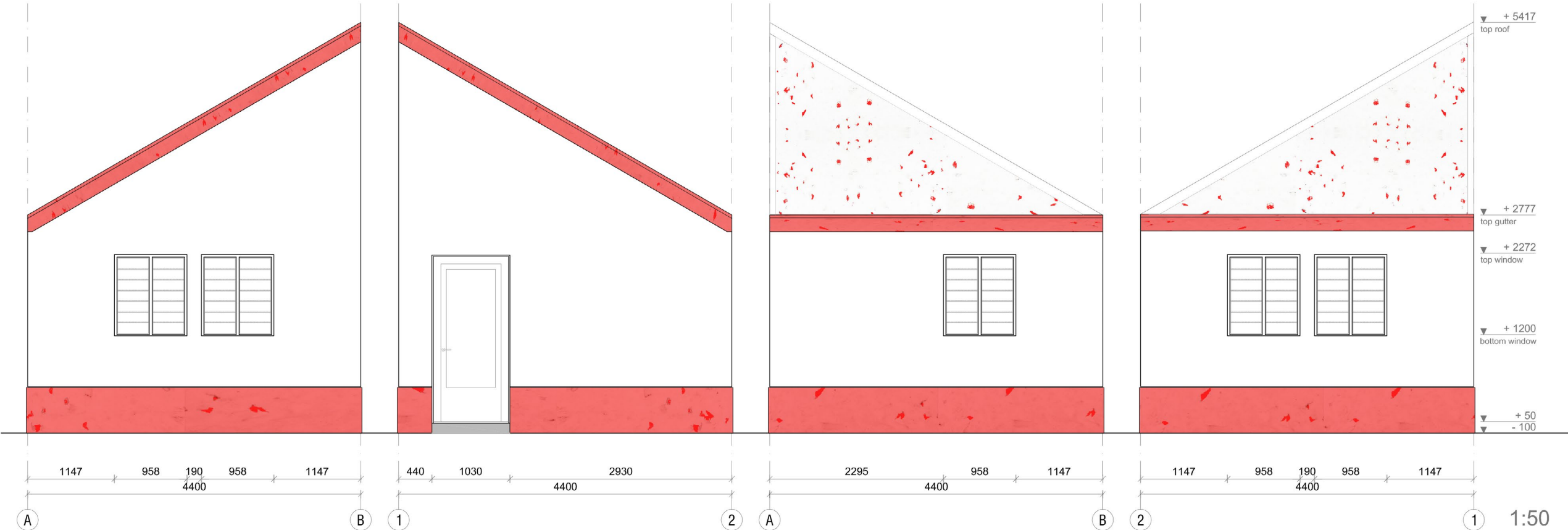
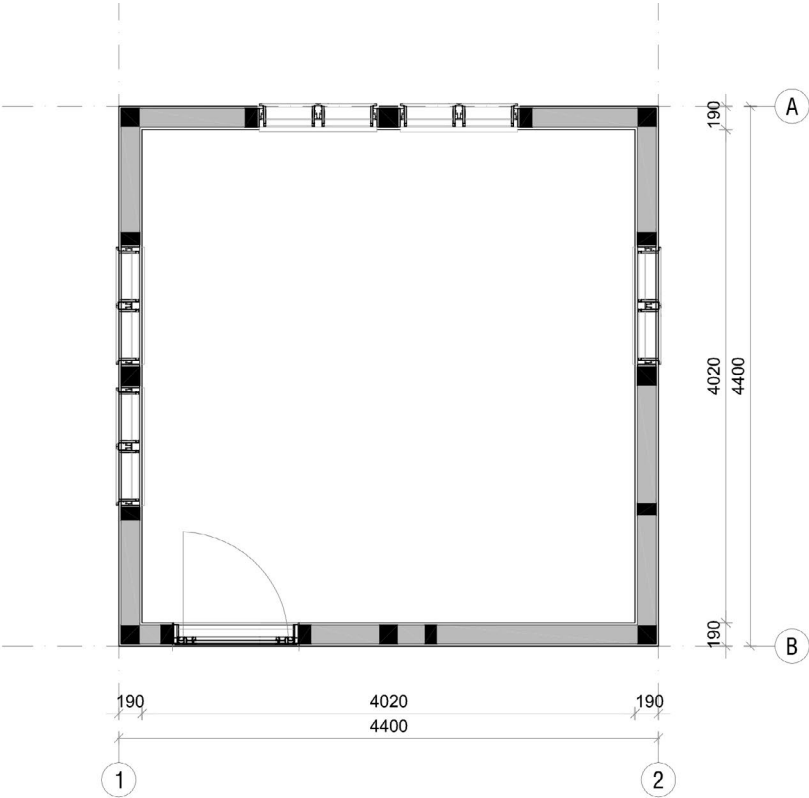
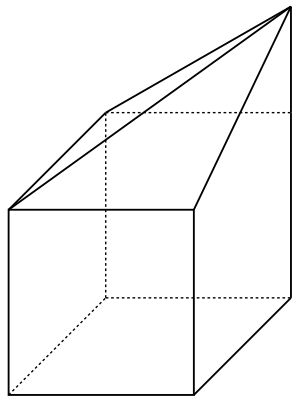


4 unit

# STRUCTURE OF GROWTH

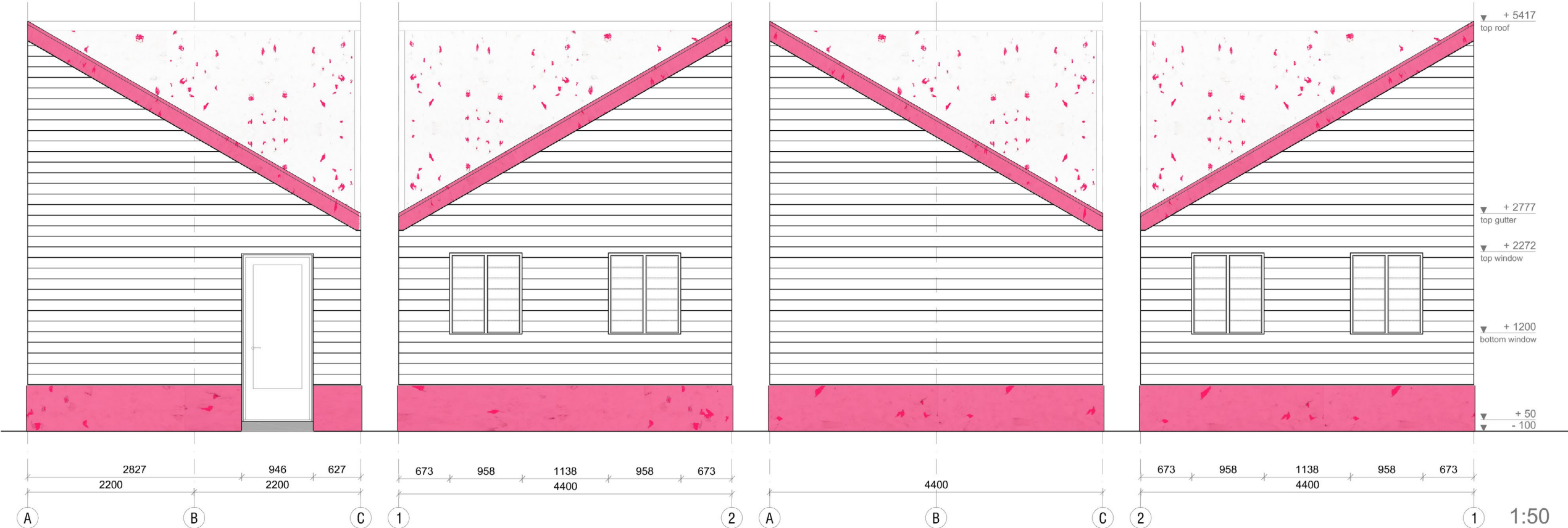
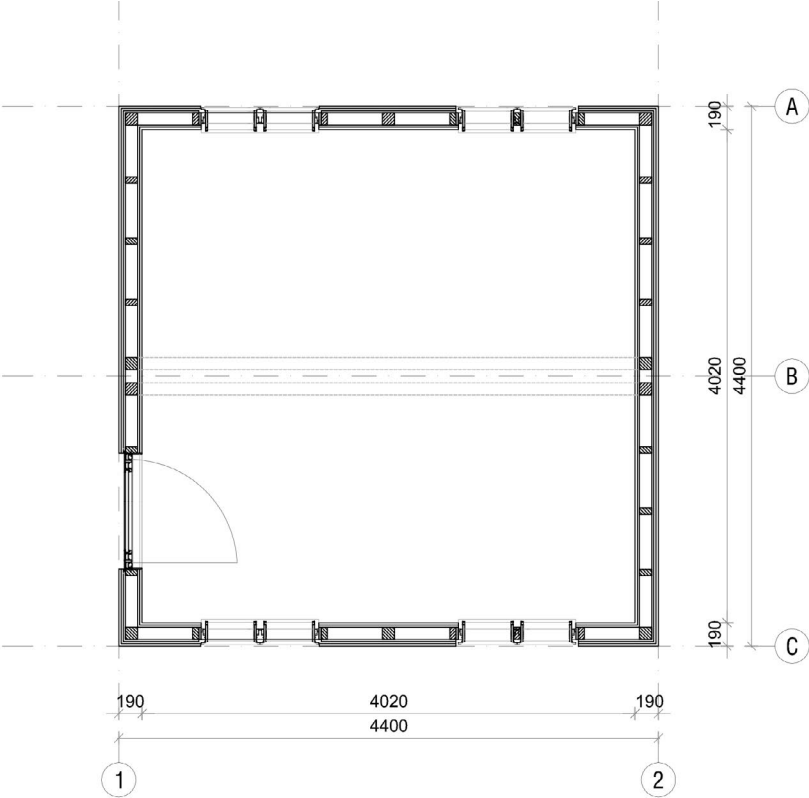
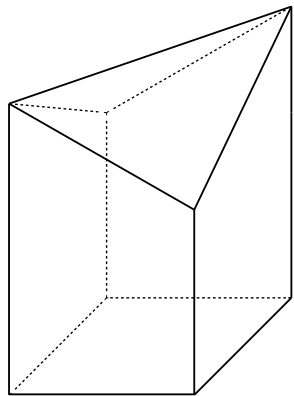


UNIT

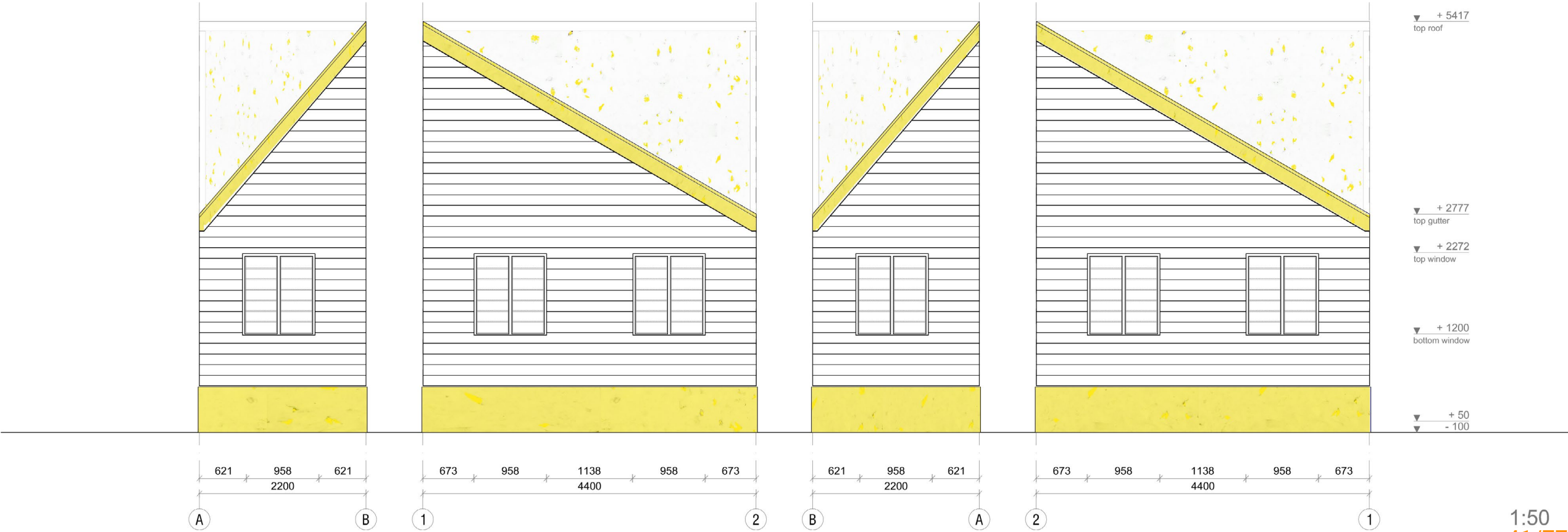
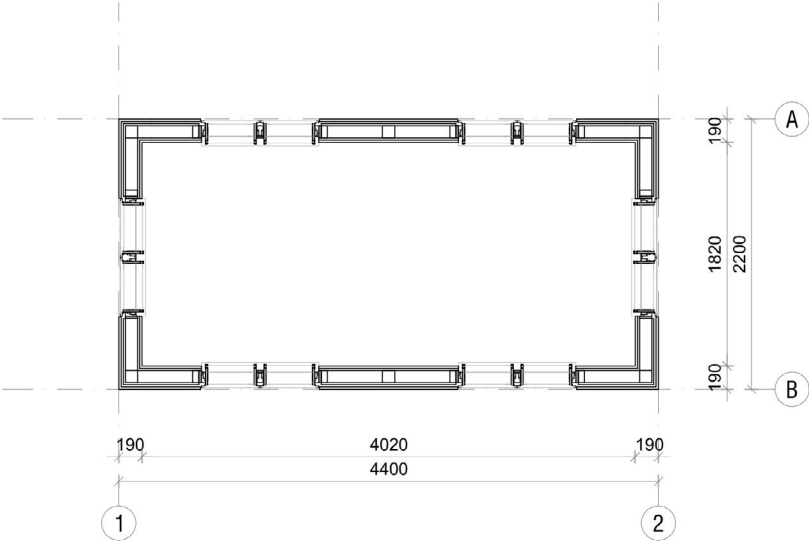
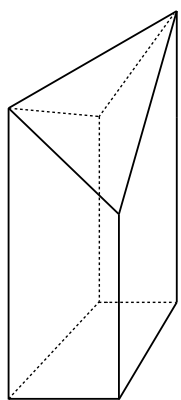




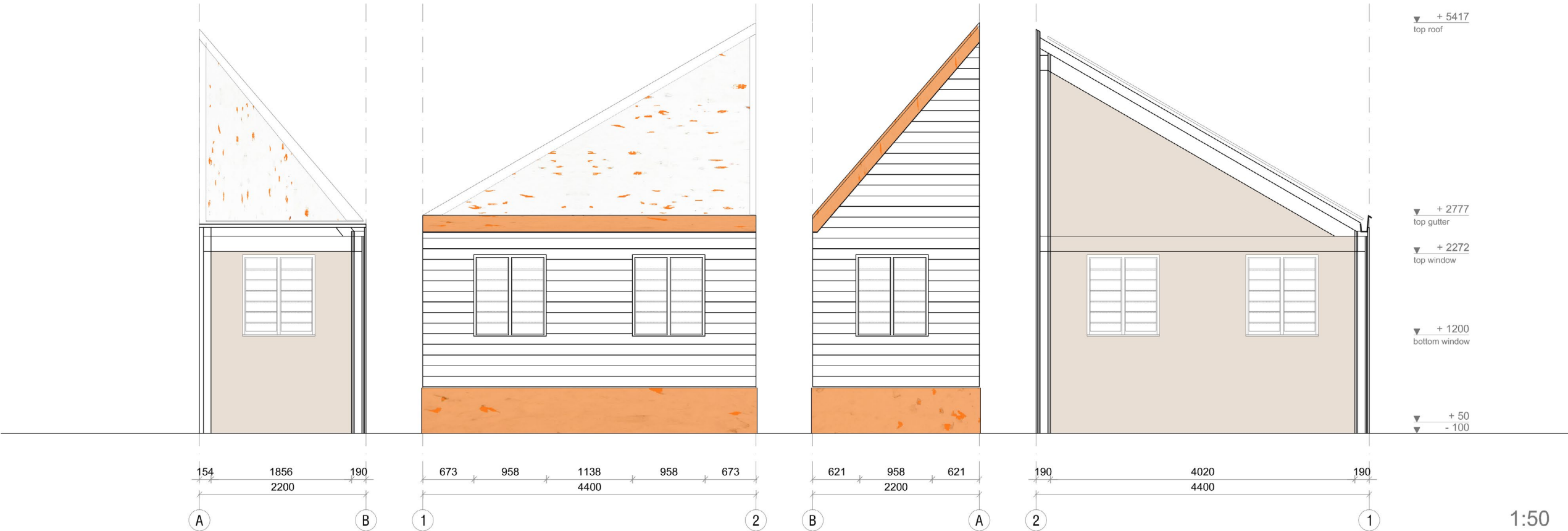
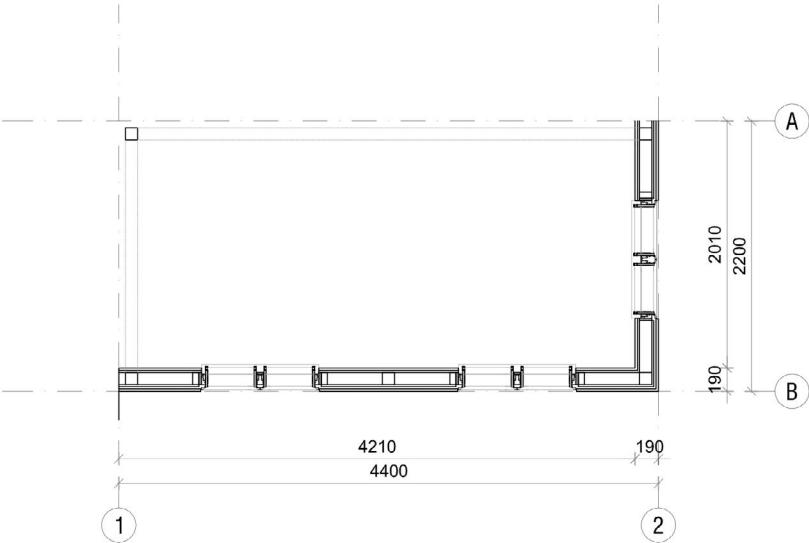
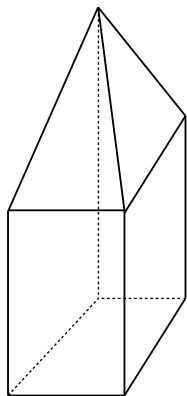
UNIT



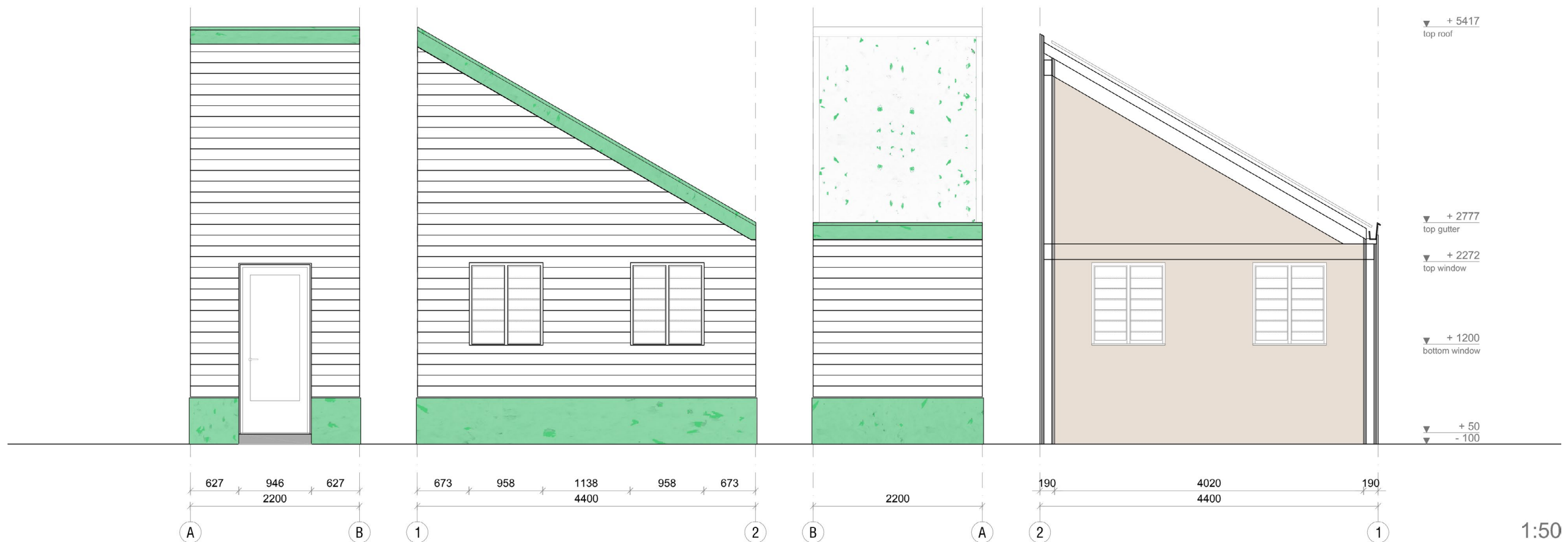
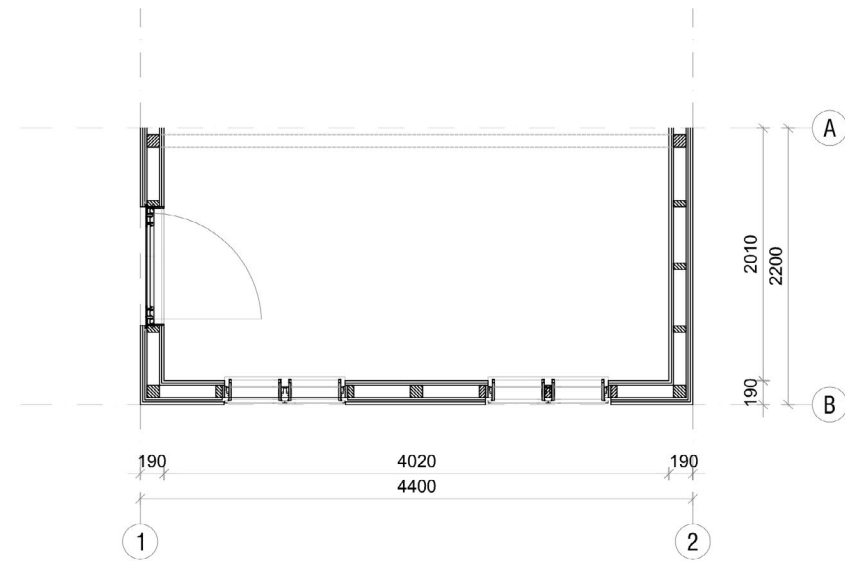
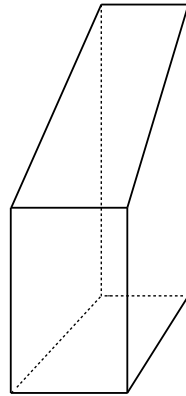
UNIT



UNIT

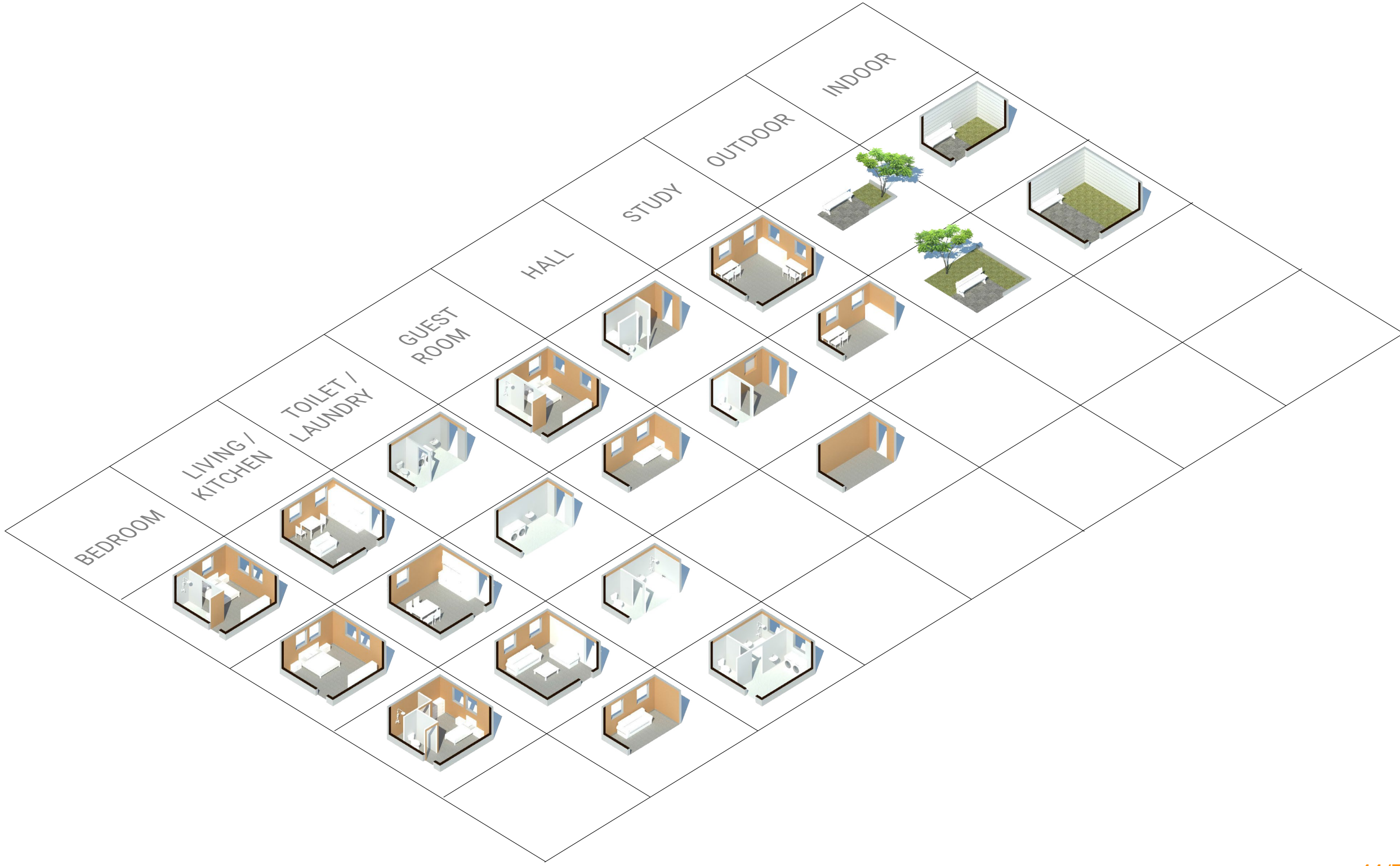


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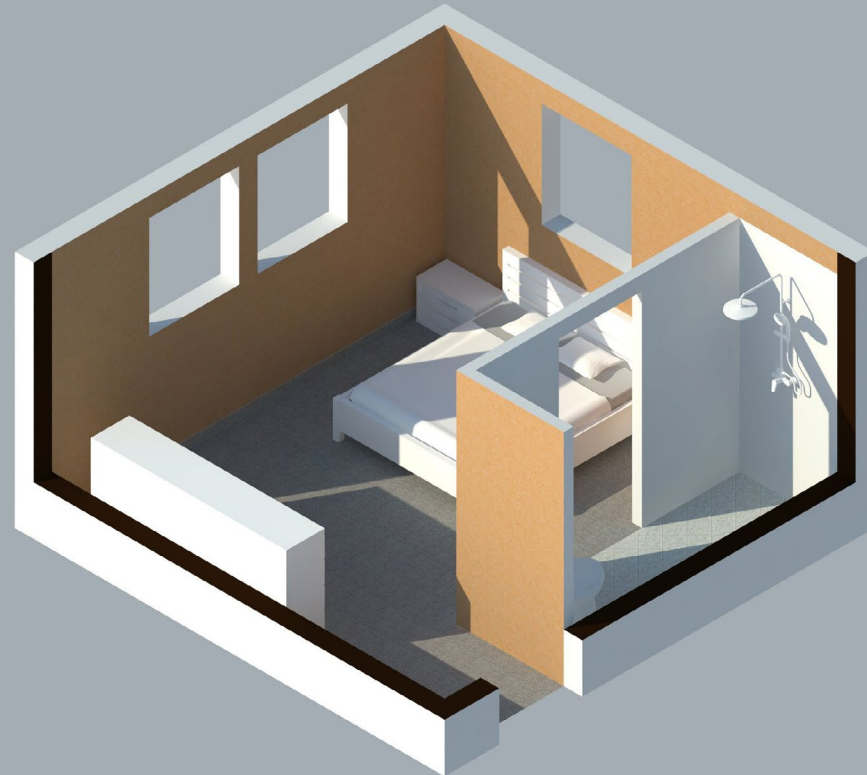




CONCEPT

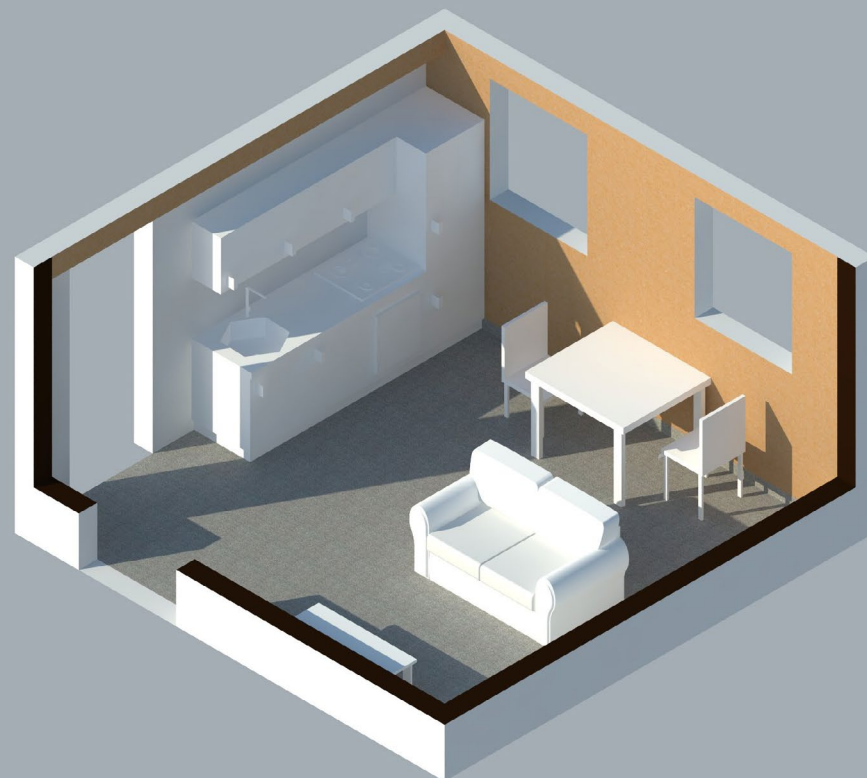


# CONCEPT



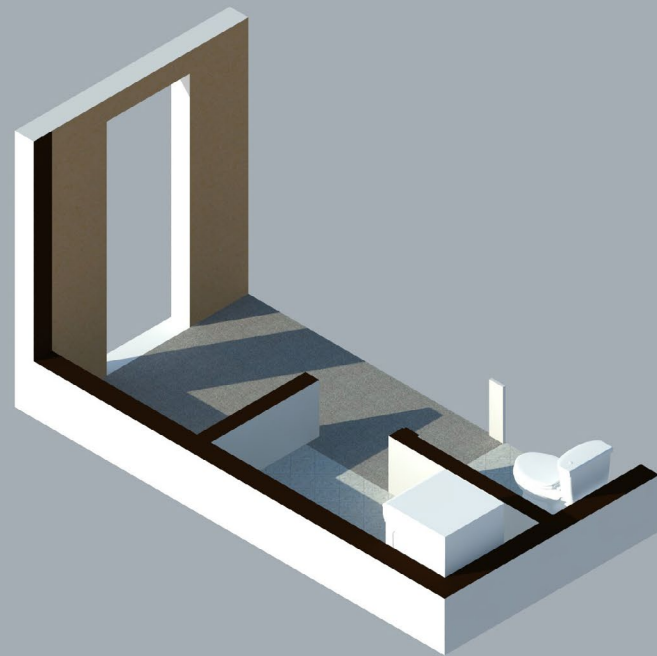
CONCRETE  
UNIT 15,9 M2

# CONCEPT



KITCHEN/  
LIVING  
UNIT 16,9 M2

# CONCEPT



STORAGE  
TOILET  
UNIT 7,4 M2



# CONCEPT



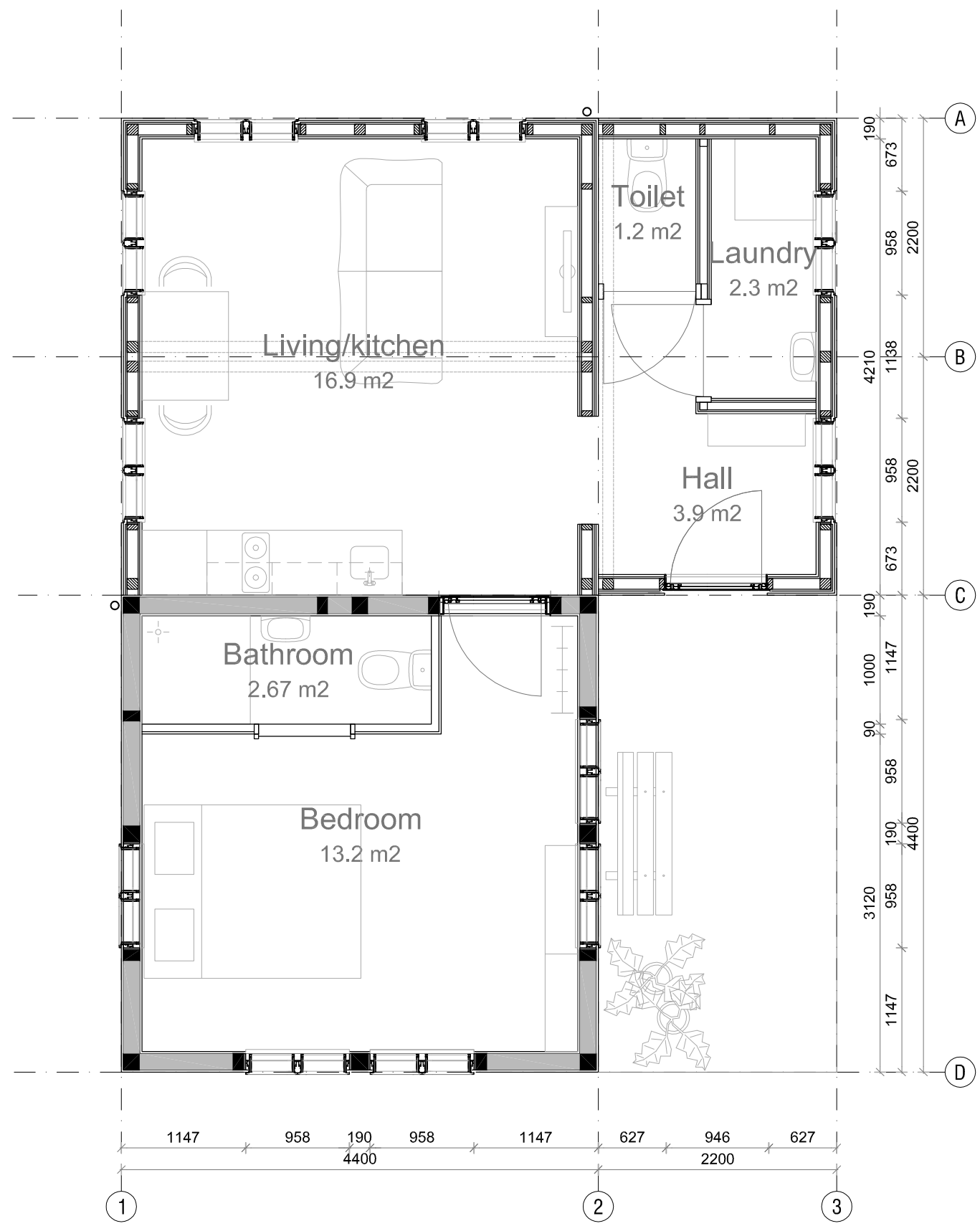
OUTDOOR  
UNIT 9,7 M2

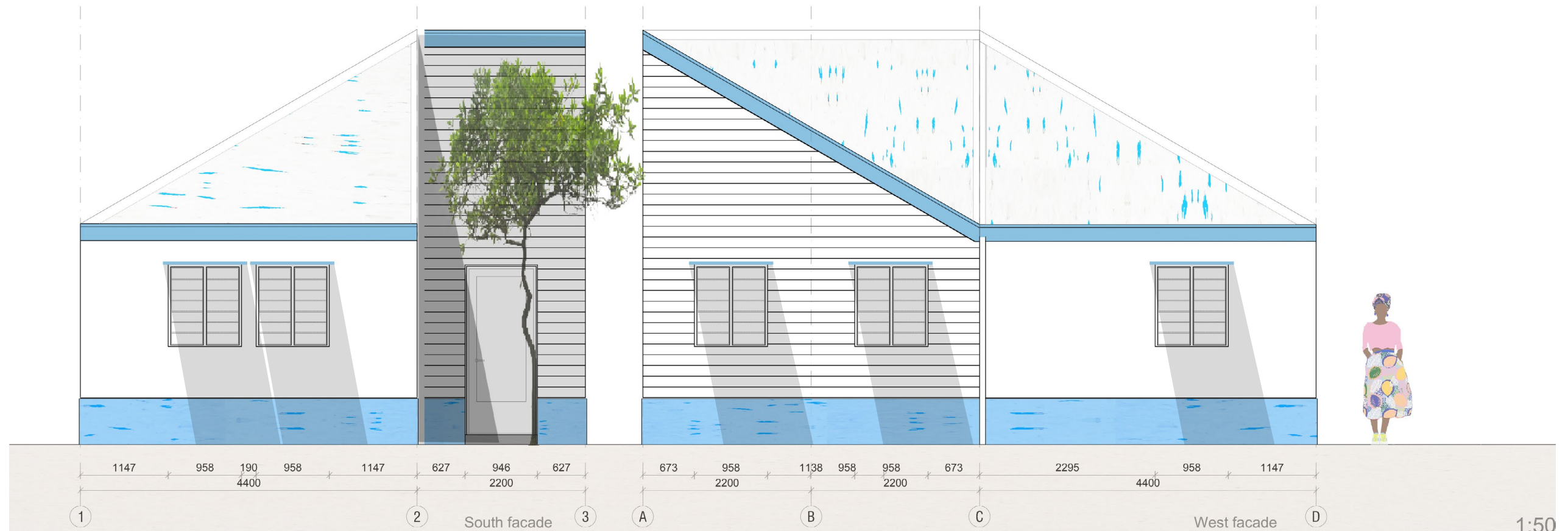
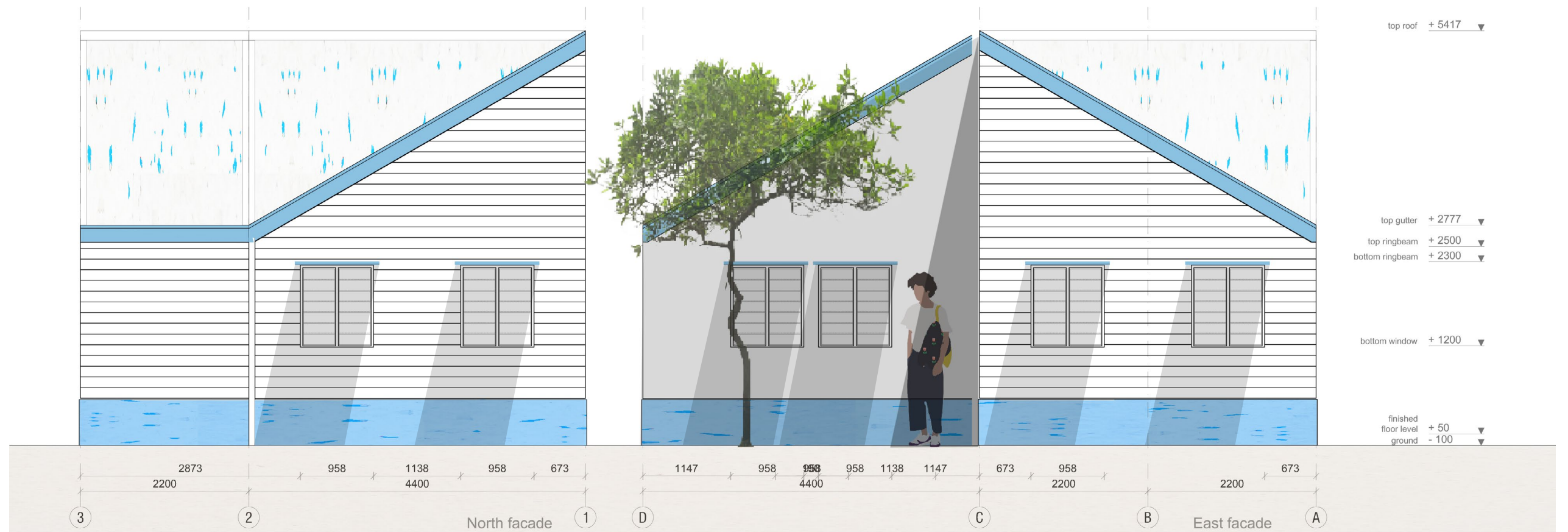
# CONCEPT



TOTAL UNIT  
49,9 M2

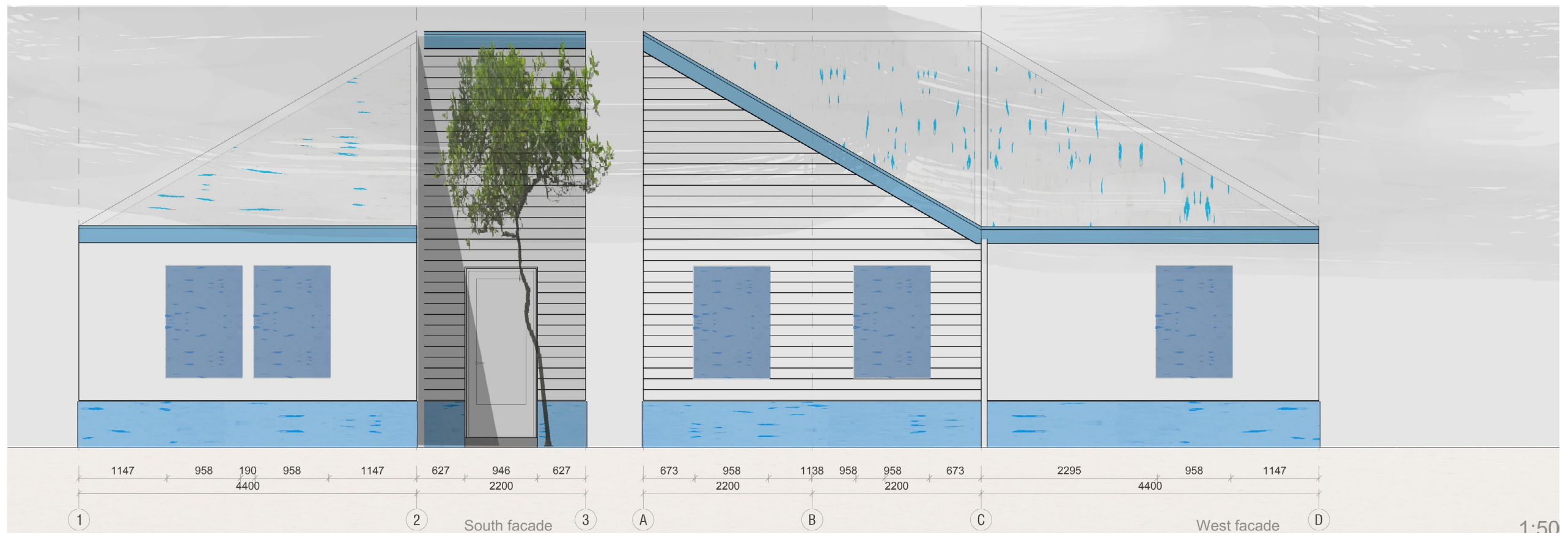
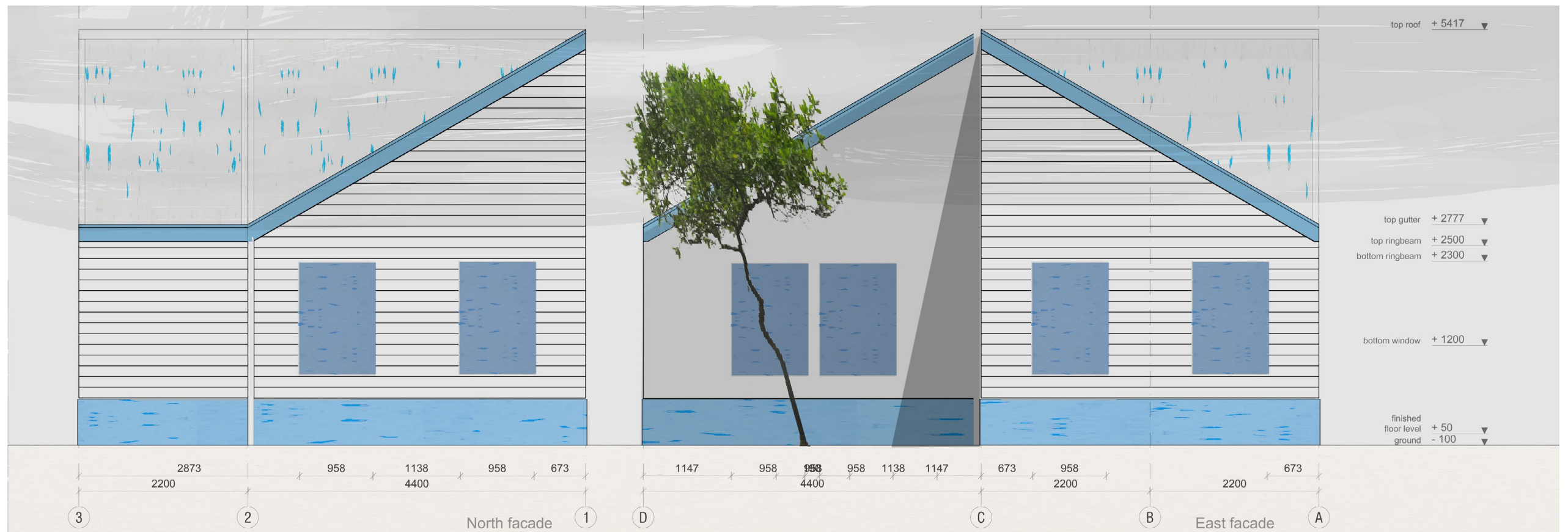
CONCEPT





1:50





1:50

# FACTORY



## BUILDING ORDER

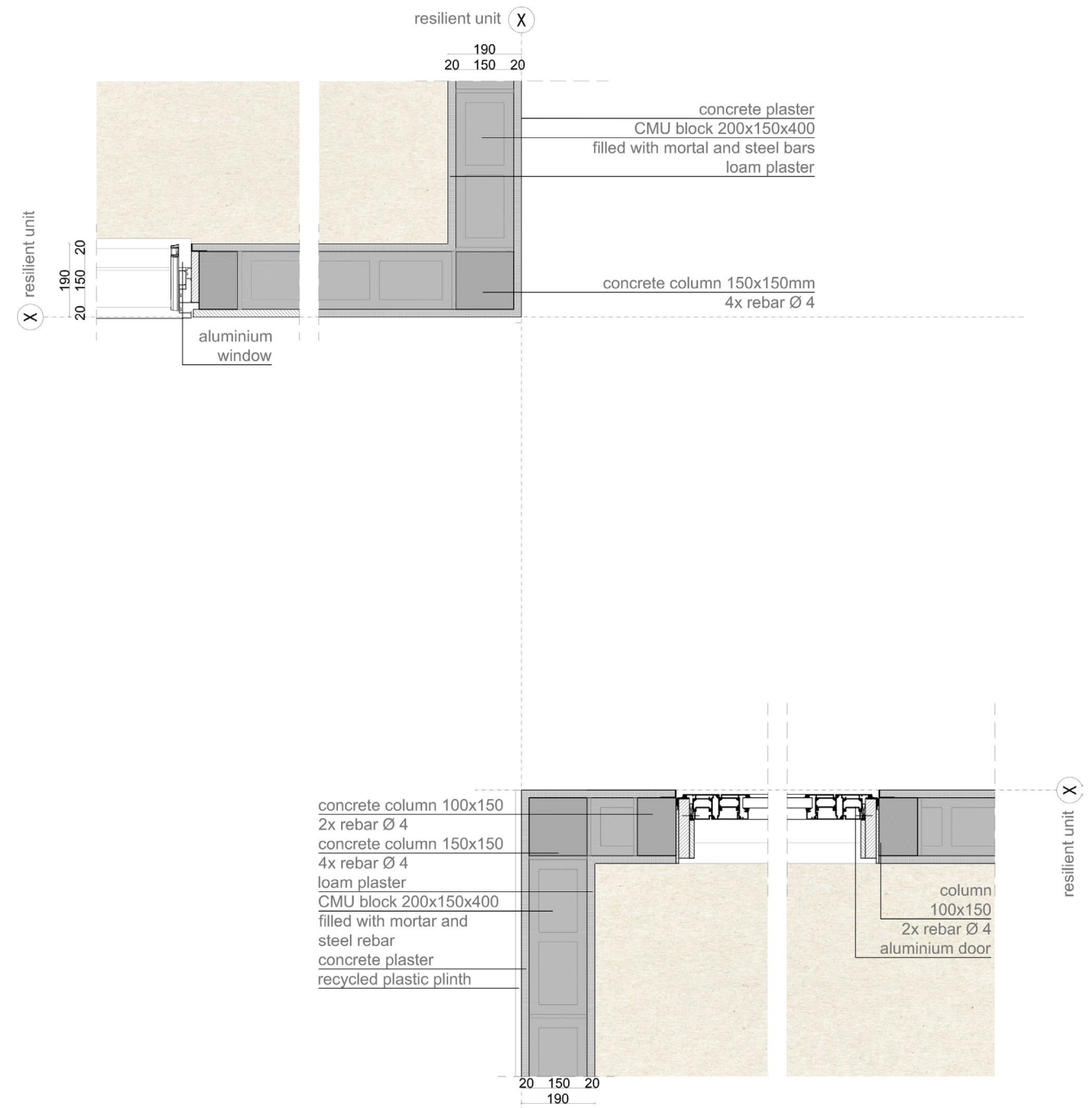
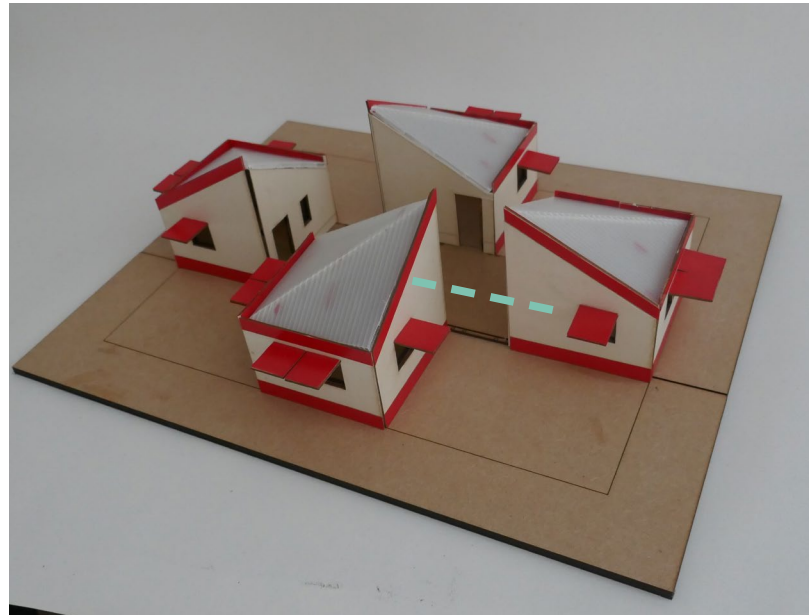


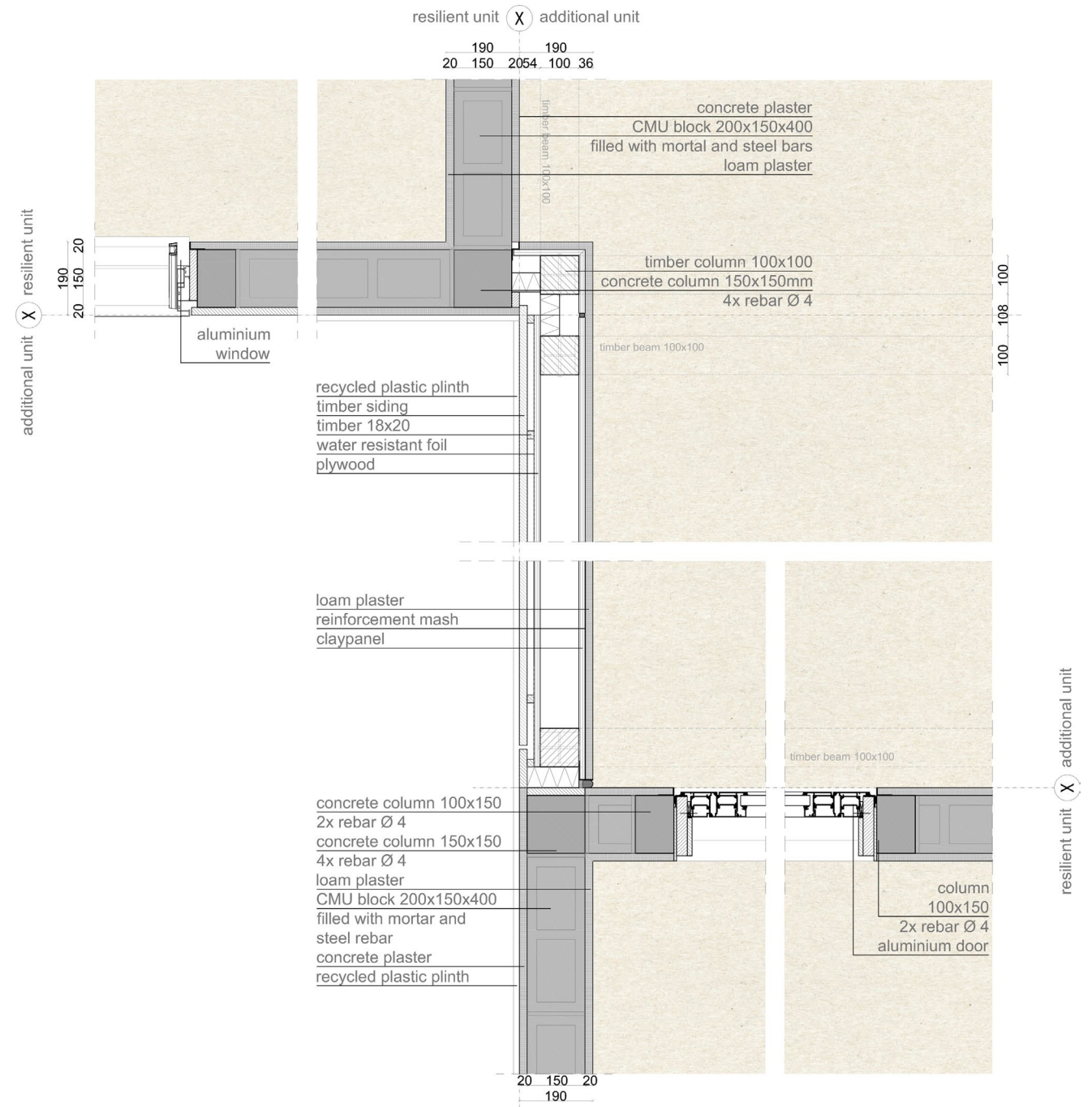


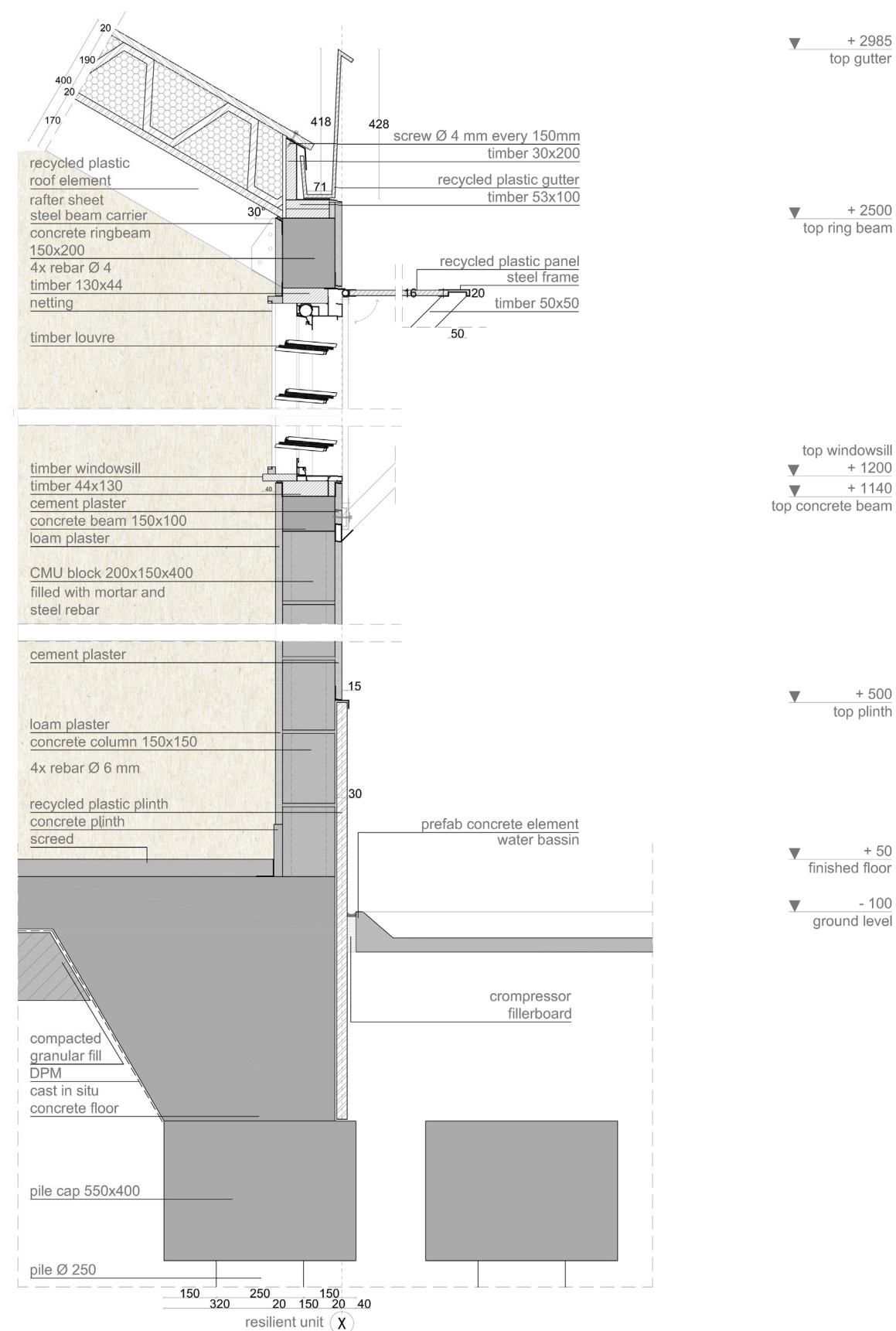
## BUILDING ORDER



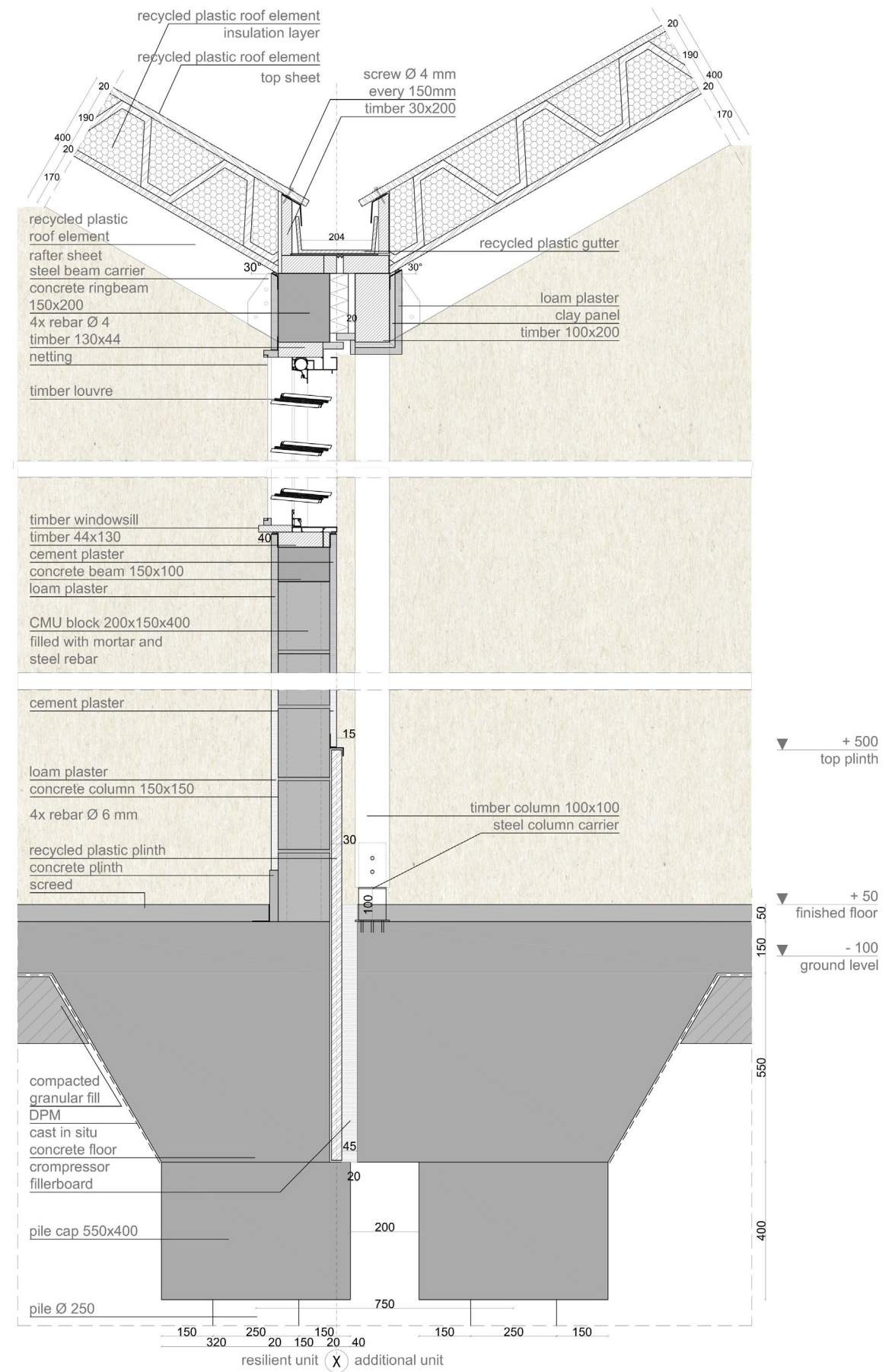
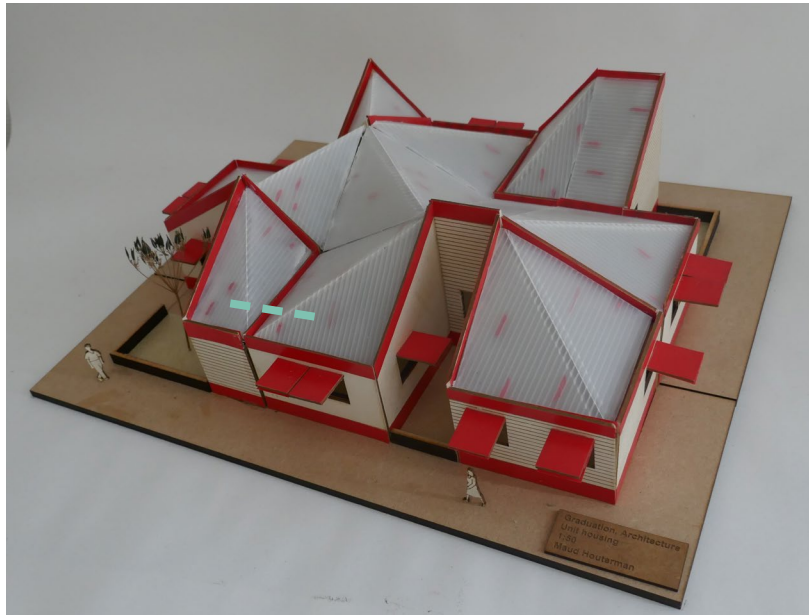










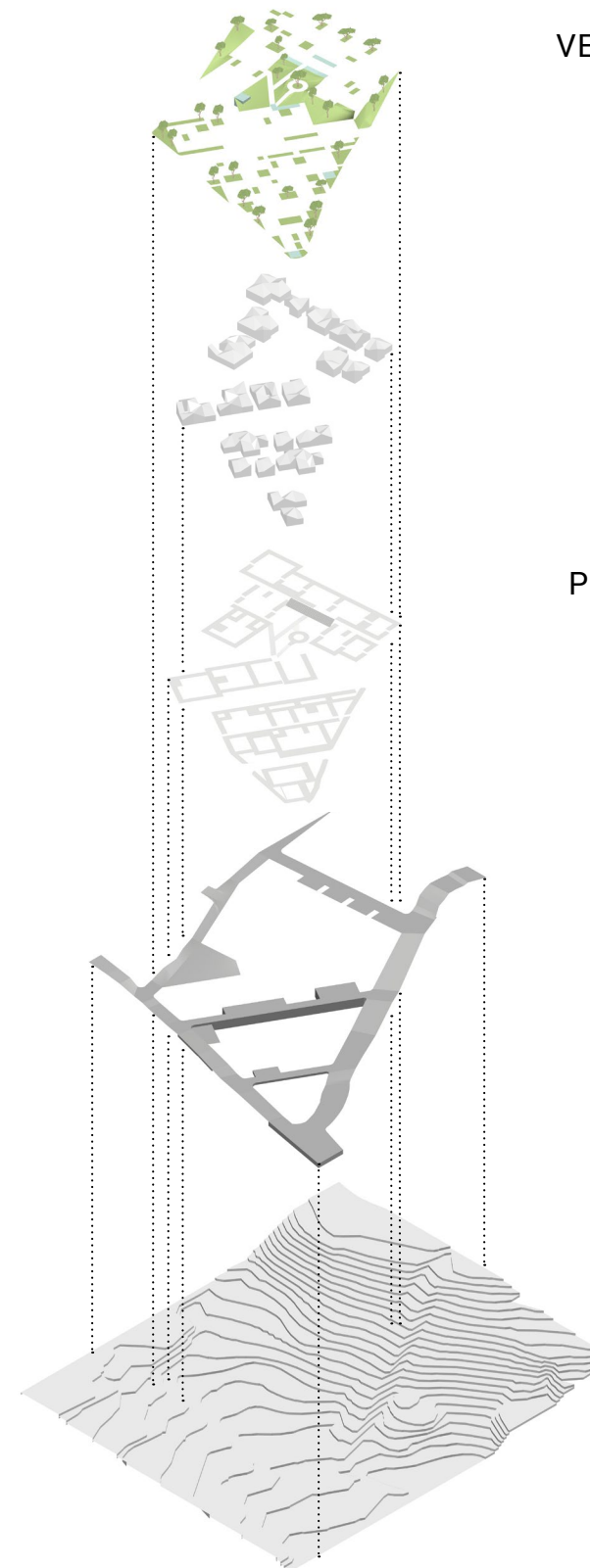
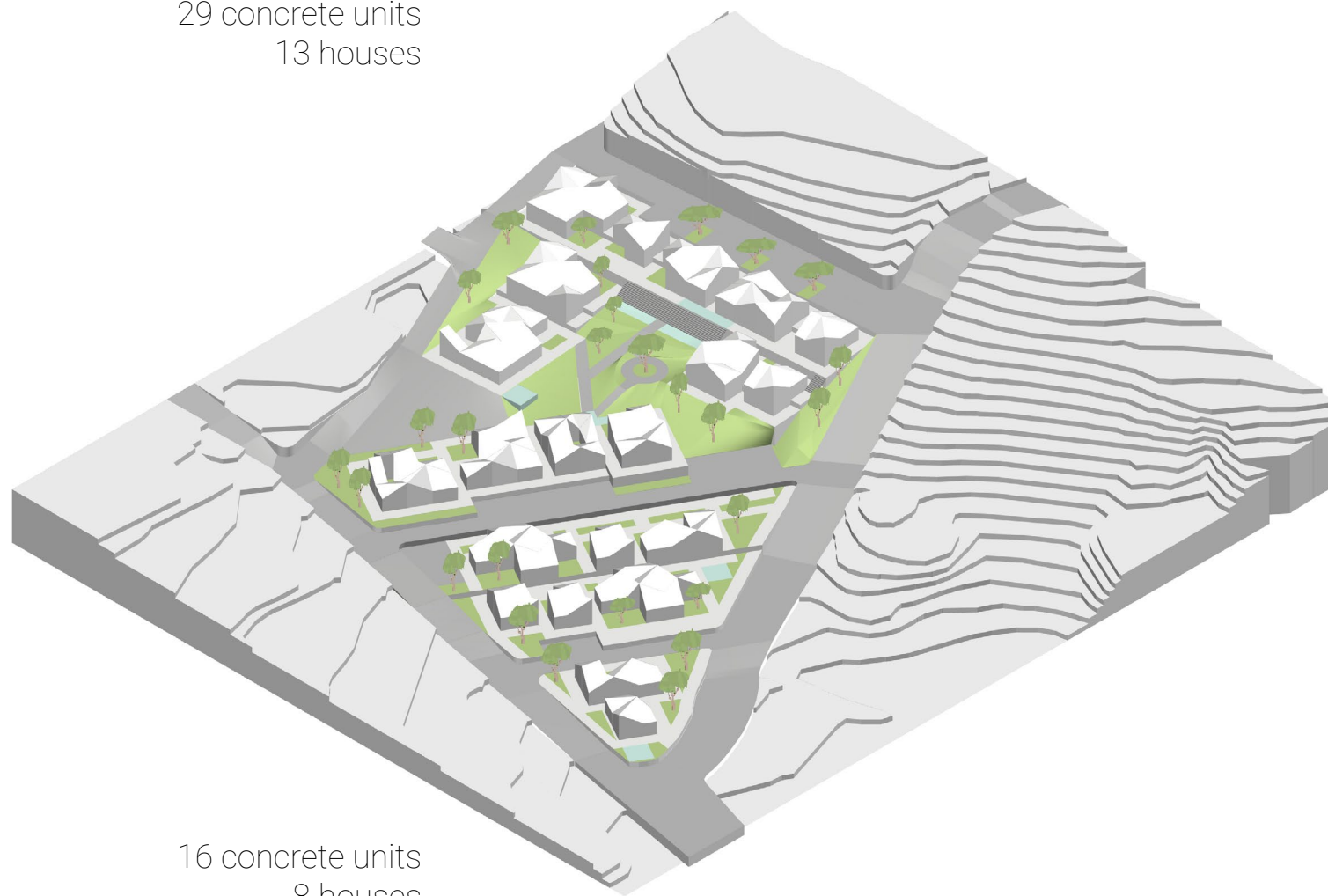




# URBAN PLAN

29 concrete units  
13 houses

16 concrete units  
8 houses



## VEGETATION AND WATER

Includes private and public gardens, water storage and playground for children.

## HOUSING

Rental and owner occupied homes for elderly and families.

## PEDESTRIAN PATHWAYS

The pathways connect houses and form a neighbourhood. Trees and canopy's provide shade.

## ROADS

The roads are one way roads. Includes 52 parking lots.

## SITE

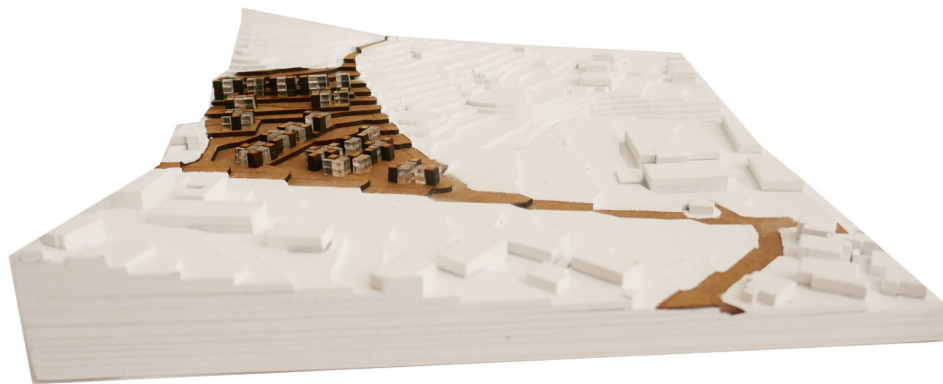
7.875 m<sup>2</sup>  
Cul de Sac  
Height difference 14 m

# URBAN PLAN



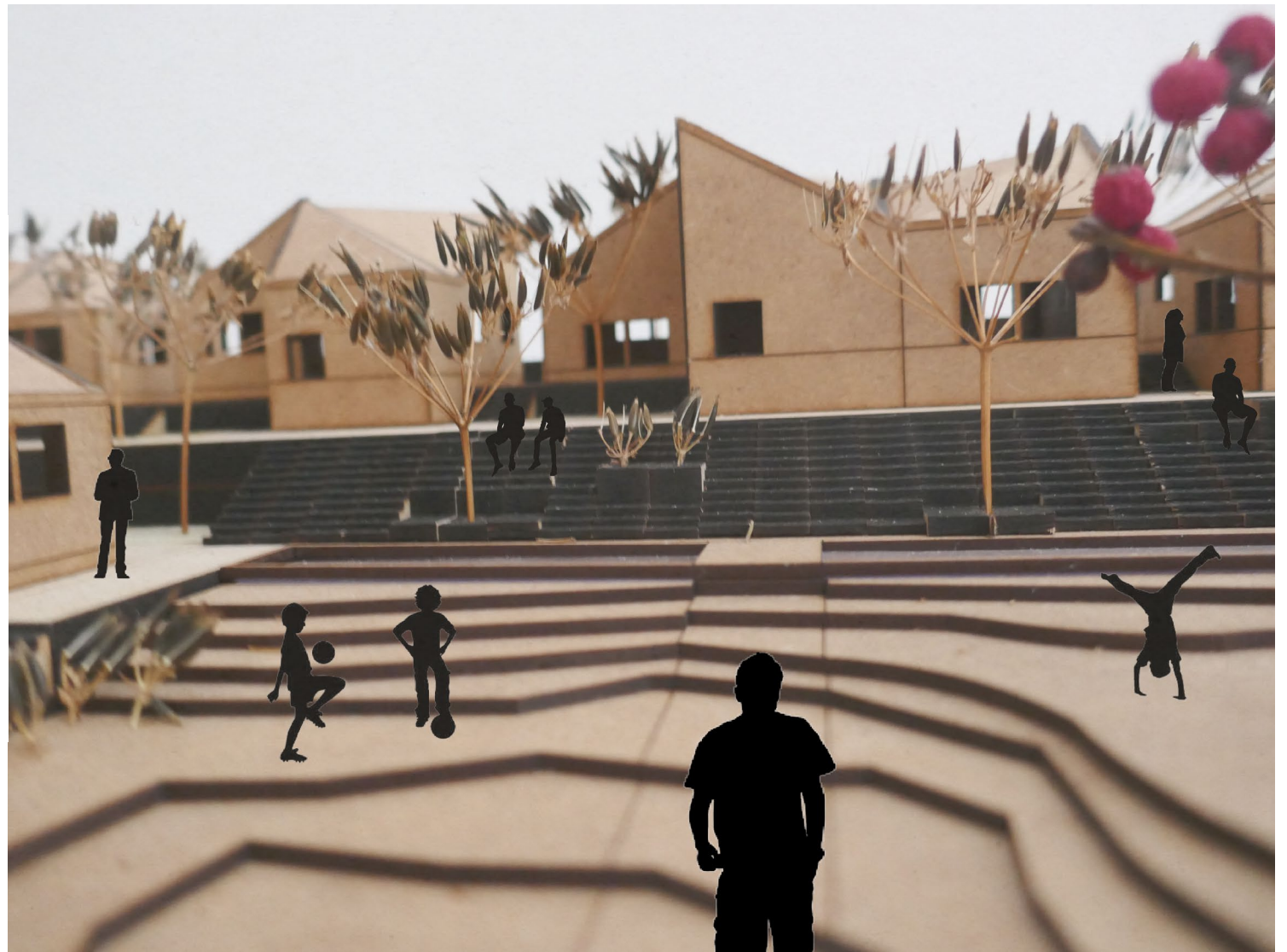


# URBAN PLAN













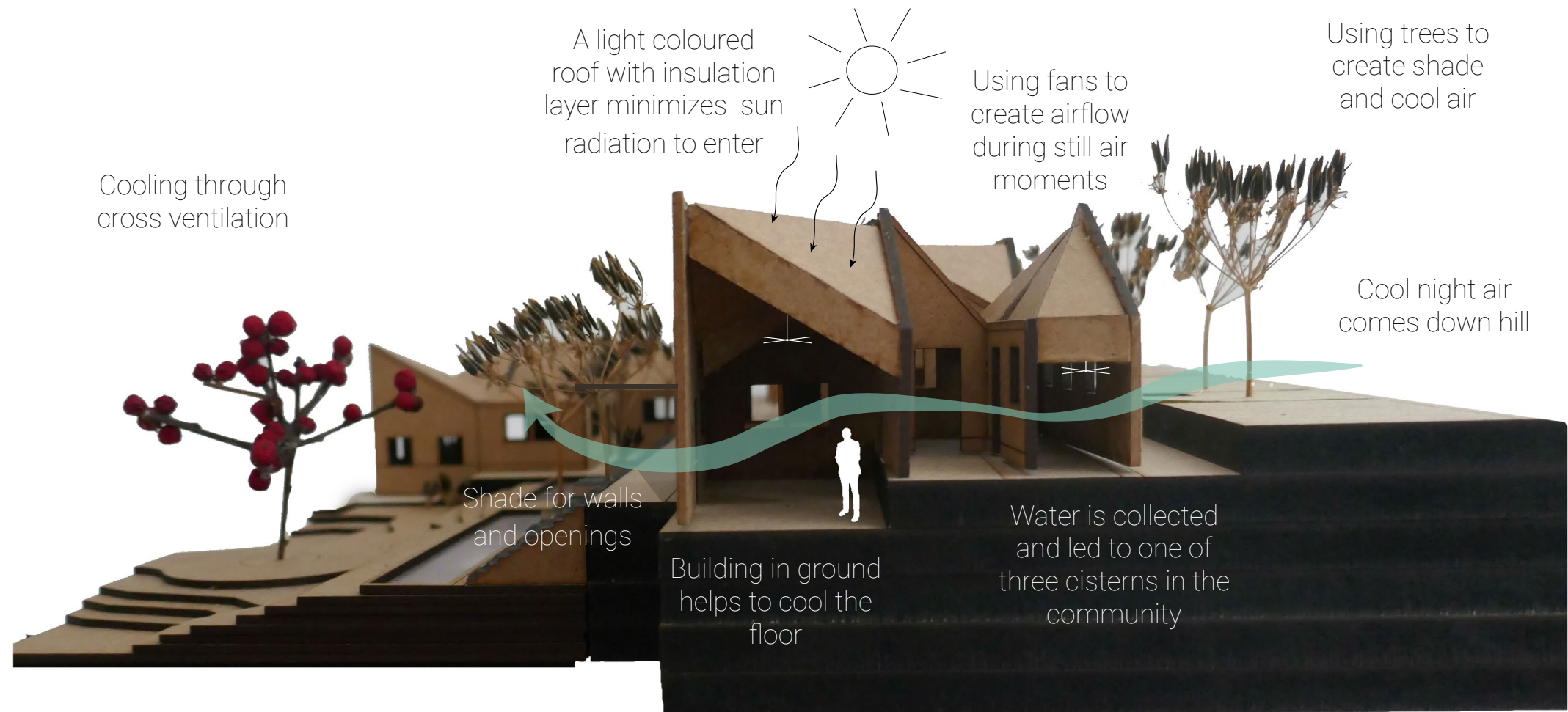




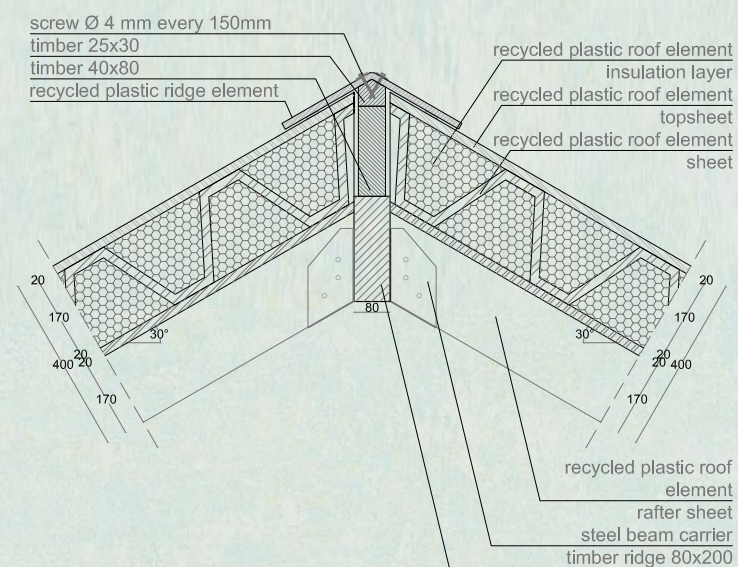
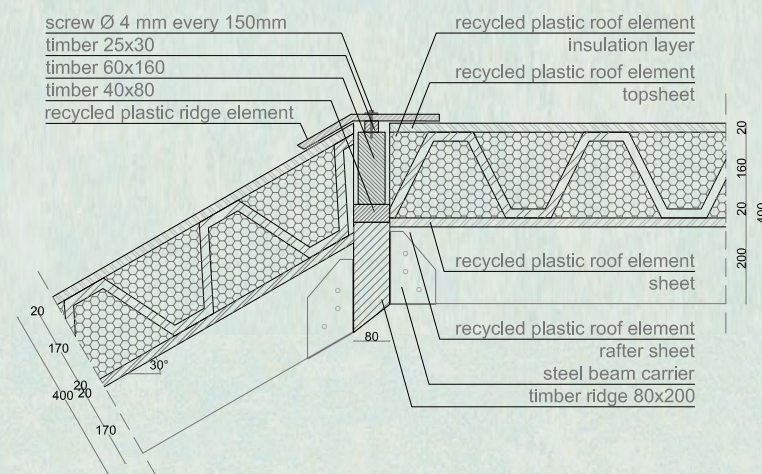




# CLIMATE









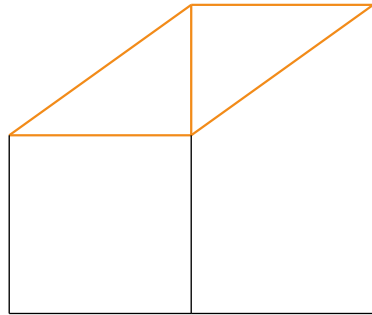




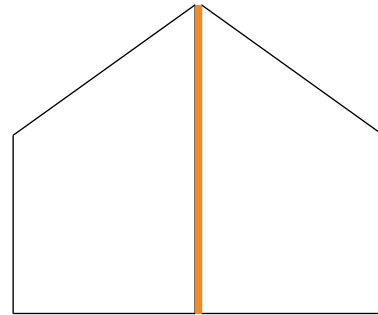
## CONCLUSION



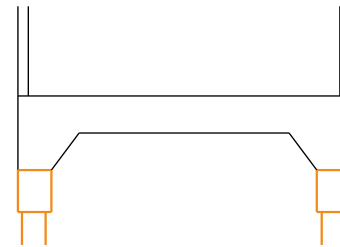
# CONCLUSION



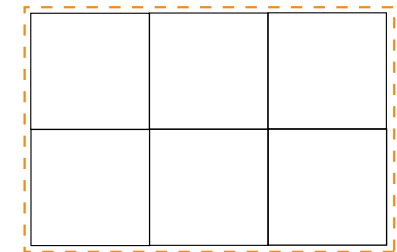
ROOF CONNECTION



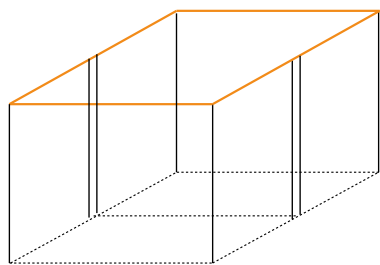
MOVING SPACE



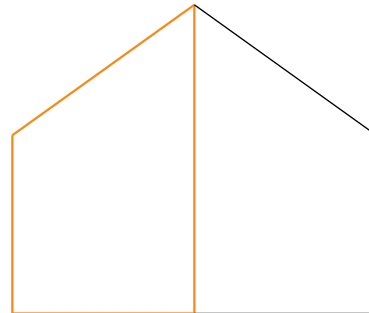
USE OF FOUNDATION



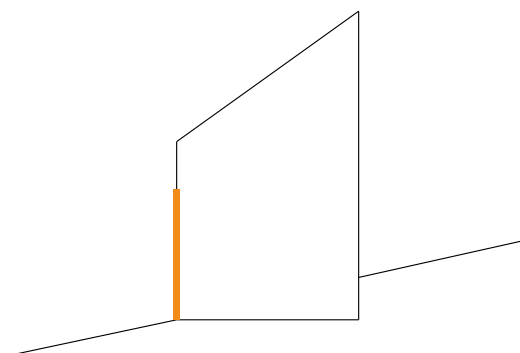
ALIGNMENT



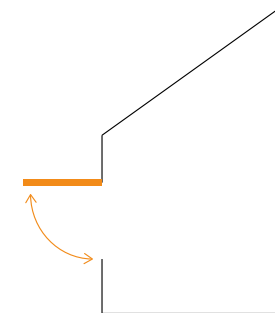
RINGBEAM CONNECTION



RESILIENT UNIT



OPENINGS AT LOWEST  
POINT



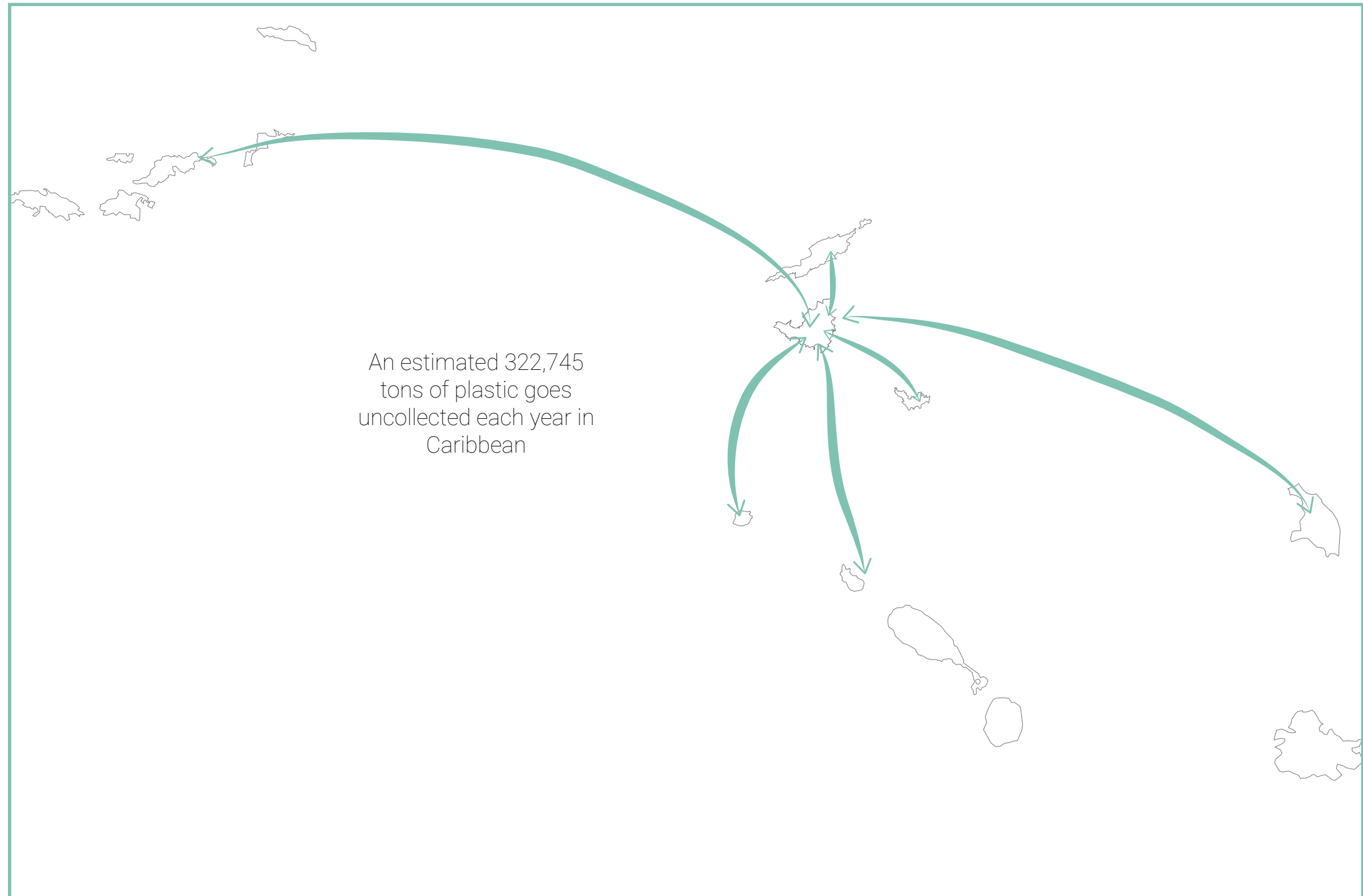
AWNING



# RELEVANCE



# RELEVANCE







“For people living in areas prone to natural disasters, a resistant home can make the difference between total property loss and a safe haven.”





THANK YOU